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CONTENTS

THE WHOLE OF THE LITERARY MATTER IN THE LANCET IS COPYRIGHT.

ADDRESSES AND ORIGINAL ARTICLES.

Injuries of Tendons and Muscles. By HAROLD C. EDWARDS, F.R.C.S.—(*Illustrated*) 65
The Mechanism of Diastolic Blood Pressure. By C. B. ROSSITER, M.D.—(*Illustrated*) 71
Acute Rheumatism and the Sedimentation Rate. By WILFRID W. PAYNE, M.B.—(*Illustrated*) 74
Erythrocyte Sedimentation Rate in Rheumatic Fever. By FRANCIS BACH, M.D., and N. GRAY HILL, M.B. 75
Pepsin Therapy of Gastric and Duodenal Ulcer. By Prof. K. GLAESSNER, M.D. 77
Low Spinal Anæsthesia. By J. K. HASLER, M.B. 80
On a Divergence Between the Biological and Gamma Ray Effectiveness of Radium Tubes. By S. RUSS, D.Sc., and G. M. SCOTT 82

CLINICAL AND LABORATORY NOTES.

A Source of Error in Measurements of Urine Secretion, including Renal Efficiency Tests. By P. M. TOOKEY KERRIDGE, M.Sc., and Prof. ARTHUR ELLIS, F.R.C.P. 83
A Record of an Attack of Mania. By L. C. BRUCE, F.R.C.P.—(*Illustrated*) .. 83
An Unusual Combination of Left-handedness and Stammer. By LOIS MUNRO, M.B.—(*Illustrated*) 84

MEDICAL SOCIETIES.

North of England Obstetrical and Gynæcological Society 85

REVIEWS AND NOTICES OF BOOKS.

Chemical Embryology. By Joseph Needham, M.A., Ph.D. 86
Die Hormone des Ovariums und d. Hypophysenvorderlappens. By Prof. Dr. Bernhard Zondek .. 86
The Mind in Action. By Prof. A. Campbell Garnett, M.A. 87
Accidental Injuries. By Henry H. Kessler, M.D., F.A.C.S. 87
Lehrbuch der Röntgenstereoskopie. By Dr. Max Cohn and Dr. Walther Barth 87
A Text-book of Physical Education. By Prof. J. F. Williams, M.D., and W. R. Morrison, M.D. 88
Infant Feeding in General Practice. By J. C. V. Braithwaite, M.R.C.P. 88
Quatre cents consultations médicales. By Dr. Jules Comby 88
Analyses médicales pratiques. By René Clogne 88

LEADING ARTICLES.

WOMEN AND NATIONAL HEALTH INSURANCE 89
THE FUNCTIONS OF THE INTERVERTEBRAL DISCS 90
CHRONIC LYMPHANGITIS AS THE CAUSE OF CANCER 92

ANNOTATIONS.

New Year Honours 92
Obesity and Water Balance 93
A Guide to the Activity of Rheumatic Infection .. 93
Carbon Dioxide and Spinal Analgesia 93
Infection and Hepatic Function 94
The Coronary Blood Flow 94
Plastic Surgery of the Nose 95
An Unusual Treatment for Peptic Ulcer 95
The Lymphoid Tissue in the Lung 96
A Great Journalist 96

SPECIAL ARTICLES.

Cattle Ringworm in Man. By GEORGE ASHTON, M.R.C.P. 97
United States of America: Milk Control 99
Australasia: Contributory Schemes and the Medical Profession 100
The Lübeck Trial.—(*Continued*) 102
Ireland: Honorary Fellowships 102
Glasgow's New Hospital.—(*Illustrated*) 103
Medicine and the Law: "B.P." as a Description of Drugs 104
New Year Honours 104

CORRESPONDENCE.

Research in Asthma: the Urinary Proteose (Dr. E. T. Conybeare) 107
Protein in Asthma (Dr. Thomas Nelson) 107
A New Method of Approach to the Semilunar Cartilages of the Knee-joint (Mr. Harry Platt) 107
Prognosis in Leukæmia (Dr. A. Knyvett Gordon) 108
The Ætiology of "Malta Fever" (Lieut.-Col. A. G. P. Gipps) 108

PUBLIC HEALTH SERVICES.

Annual Reports of Medical Officers of Health.—Belfast.—Newcastle-upon Tyne.—Cardiff 105
Infectious Disease in England and Wales 106

OBITUARY.

Nicol Rankin, M.B. 108
Benjamin W. Thomas, M.R.C.S. 109

THE SERVICES.

Royal Naval Medical Service.—Royal Army Medical Corps.—Indian Medical Service.—Royal Air Force.—Honorary Surgeon to the King 108

MEDICAL NEWS.

University of London 109
Society of Apothecaries of London 109
King Edward's Hospital Fund 73
Hospital Grounds as Bird Sanctuary 96
Northamptonshire Convalescent Home 99
Coventry and Warwickshire Hospital 102
Royal College of Surgeons of England 109
Board of Control 109
Medical Society of Individual Psychology 109
West London Medico-Chirurgical Society 109
"Chinese Medical Journal" 109
Winter in England 109
Congress of Sanitary Science 109
Order of St. John of Jerusalem 109

NOTES, COMMENTS, AND ABSTRACTS.

Preventive Medicine in its Relation to Aviation. By E. GOODWIN RAWLINSON, M.D. 111
Hockey Injuries 114
Compulsory Pasteurisation of Milk 114
James Mackenzie Institute for Clinical Research 114

Appointments 109
Vacancies 109
Medical Diary 110
Births, Marriages, Deaths 114

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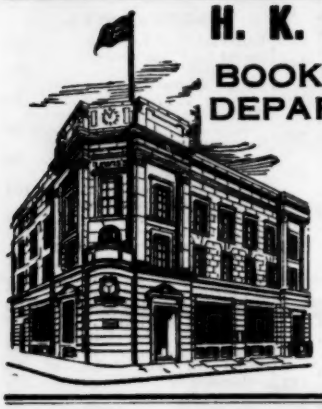

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INJURIES OF TENDONS AND MUSCLES.*

BY HAROLD C. EDWARDS, M.S. LOND., F.R.C.S. ENG.,
ASSISTANT SURGEON TO KING'S COLLEGE HOSPITAL AND THE EVELINA HOSPITAL.

BY virtue of its power of contraction, muscle may of its own accord be responsible for damage to itself or to its tendons of origin and insertion. Under normal conditions the force of contraction is balanced by the tensile strength of the muscle and its attachments, so that the most powerful contraction of the largest muscle may be carried out without fear of injury. If, however, abnormal conditions are present which will reduce the tensile strength or momentarily increase the contractile power, rupture at some point between the origin and insertion of the muscle may occur.

The importance of the contractile power of muscle in relation to injury does not end here however. A contracted muscle is less able to escape injury than a relaxed one, a fact well appreciated by the professional clown, who, by a trick of relaxing his muscles, escapes from the most incredible falls without injury.

A muscle when struck, contracts. Part of any resulting injury is due to the blow and part to the contraction, and it is impossible in most cases to assess the relative importance of the blow and of the contraction in determining the extent of the injury. When a rider jumps into the saddle, the adductors of the thigh contract when the thighs come into contact with the sides of the saddle, but a moment later the thighs are forced apart as the body falls heavily into the saddle, and lastly more violent contraction of the adductors may be made to retain

FIG. 1.

the seat, and rupture of the adductor longus may occur.

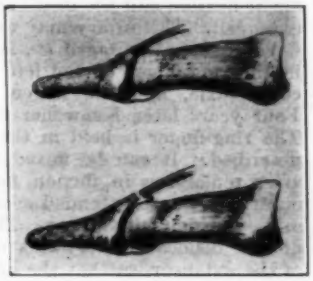
In view of these facts, it is impossible to arrive at a satisfactory classification of muscle and tendon injuries from the ætiological standpoint, and the attempts to do so—many ingenious, all unwieldy and inaccurate—bear evidence to this. As a classification is essential to form a basis for discussion, I shall use the following, which, though admittedly incomplete, has at least the virtue of simplicity. 1. Closed, or subcutaneous injury: (*a*) from external violence (direct and indirect); (*b*) from muscular violence. 2. Injury through open wounds.

Closed or Subcutaneous Injury.

DIRECT VIOLENCE.

A direct blow upon a muscle may produce a temporary inhibition of power without evidence of rupture of muscle-fibres. Such a condition is not uncommon after blows upon the deltoid and quadriceps, and is well known to boxers and Rugby players. The paralysis passes off after a few moments, but may leave the muscle weak for a considerable time. The phenomenon is little understood. It may be due to temporary damage to the nerve-endings within the muscle, as suggested by Ombredanne,[1] but I think it may arise solely from the pain caused by the blow upon the underlying periosteum, for a similar temporary paralysis of the quadriceps may follow a sharp blow upon the patella. Partial ruptures of muscles are of common occurrence from direct blows, and do not call for special comment. Tendons themselves are rarely injured in this way.

FIG. 2.



INDIRECT VIOLENCE.

Both muscles and tendons may be injured from stretching forces, such as in an attempt to reduce a long standing dislocation. Wrenching of a limb caught in machinery may tear the muscles at some distance from the site of the external injury, and examples of rupture of the biceps humeri from this cause are to be found.[2] Avulsion of a tendon due to explosive violence at a point remote from the actual tear in the tendon is another example of rupture from indirect violence. Fig. 1 shows the flexor longus tendon of the index-finger torn away from muscle-fibres—i.e., at the musculo-tendinous junction—as the result of the explosion of a powder flask in the hand.

One of the best examples of rupture of a tendon by indirect violence is that of the insertion of the finger extensor into the base of the distal phalanx, mallet finger. Such an injury may result from a misjudged attempt to catch a hard ball, the impact being taken by the tip of the finger, which is held partially flexed and tense, incurved towards the palm. More trivial injuries, such as tucking in bedclothes, may be a cause in older people, and it is significant that the middle and longest finger is easily the most common one to be affected. Two varieties occur (Fig. 2)—namely, rupture of the tendon, and tearing-off of the prominence at the base of the phalanx into which the tendon is inserted (disinsertion).

There is a choice of treatment between splinting and operation, and good results are to be obtained by either method. The most convenient form of splint is that of Lewin. It is made of aluminium, and holds the distal joint in hyperextension. The splint should be worn for six weeks, and therein lies the disadvantage of the treatment, especially among hospital patients, for they are apt to weary of it, or to remove it at intervals to see how the finger is getting on. For this reason, I prefer operation. An incision is made along the lateral border of the finger extending from the first joint to a point midway between the second joint and the nail bed, and a second joins the distal end of this at right angles.

* Based on a paper read before the British Orthopædic Association at Newcastle, on Oct. 31st, and representing a part of the Robert Jones Essay, 1930.

The injury is exposed by turning up the flap so formed, and the proximal end of the tendon is sutured to the periosteum at the base of the phalanx.

Fig. 3 shows the result obtained in a boy of 12 years. There is no disability. Fig. 4 is of a case of particular interest in that no less than 26 days intervened between the injury and the operation, during which there was no attempt at treatment. Both flexion and extension are slightly limited. The patient is a man of 48 years, who ruptured the tendon tucking in bedclothes. The deformity of the nail which follows operation is due to disturbance of the nail bed, and disappears in two to three months.

The baseball finger of American authors [3] is a similar injury, but in this case it is the extensor slip to the middle phalanx which breaks. The deformity is characteristic, with the proximal joint held in slight flexion, and the distal extended, but not hyperextended. This injury may cause snapping or trigger finger. A woman, aged 50, felt a snapping sensation in the ring-finger of the left hand when carrying a coal-scuttle, and the finger has been weak since. Four years later I saw her on some other account. The ring-finger is held in the characteristic position described. It can be flexed up into the palm, but after remaining in flexion for some time after the other fingers are extended again, shoots involuntarily into extension with a snap. The condition is probably due to dislocation forwards of the two intact slips of the extensor, so that the head of the first phalanx is imprisoned between them, and on contraction of the extensor with the finger flexed the patient is unable to straighten it, but grips the head of the phalanx more tightly. The finger straightens out with a snap when both extensors and flexors are relaxed together.

MUSCULAR VIOLENCE.

Strain of muscle is a common result of muscular violence. We may use the term to denote a painful minor injury to a muscle in which there is no evidence of gross rupture. The exact pathology of the condition is unknown, for there is no opportunity for detailed pathological investigation. In perhaps the majority of cases of strain of muscle, however, there is clinical evidence that the condition is due to rupture of a few fibres within the muscle substance. The physical signs are a localised area of deep tenderness and a temporary loss of power, either partial or complete. The tear in the muscle may be limited to intramuscular connective tissue, a small patch of hæmorrhage, or of œdema resulting.

FIG. 3.

Before accepting such a hypothesis in explanation of every case, attention is drawn to the condition of what might be called subacute strain of muscle that may follow violent exercise, especially if the muscle be unaccustomed to such exercise. After the first Rugby match of the season the leg muscles may become stiff and painful on movement. There may be generalised or localised tenderness to pressure over the muscle. The condition is, in fact, clinically identical with the acute strain of muscle, except that it is more widespread. It is probably due to an accumulation of an exudate between the muscle-fibres resulting from delayed absorption of the products of excessive metabolism. I lean to the view, however, that the exudate is of traumatic origin. The attachments of the muscle-fibres to the fibrous tissue within the muscle is subjected to a long series of "insults" by the frequent and violent contraction of muscles unprepared by training for the exercise. That the condition is ultimately due to an exudate, whatever be its origin, is shown by the nature of the most effective treatment. If left alone the soreness wears off slowly. Heat and massage and exercises readily improve the condition by aiding absorption of the exudate. Exercises are of special importance, for the stiffness can often be worn off by a violent repetition of the exercises which gave rise to it originally, once the agony of the first ten minutes or so is over. A parallel condition of the tendons, clinically if not pathologically, is tenosynovitis resulting from excessive use.

FIG. 4.

The effect of an acute strain of muscle upon the rest of the muscle is of paramount importance from the standpoint of treatment. The refusal of the strained muscle to contract is due either to a temporary paralysis of the muscle, or, more probably, to reflex inhibition, as contraction is now painful. If left alone the muscle may progressively lose power, and the strain is likely to become chronic or recurrent. Furthermore, movement may be limited by adhesions or localised contraction of the muscle around the lesion within it, and it is this type of case which provides the bonesetter with the possibility of a dramatic cure by manipulation.

Muscle, like all tissues of the body, depends upon function for its well-being. It is unfortunate from the standpoint of the treatment that its function is that of contraction. In my opinion massage alone is powerless to prevent wasting of a muscle, or to restore a muscle already wasted. To rest an injured muscle ensures that a fibrous scar will form within it in due course, but at the expense of a wasted muscle. Moreover, the scar may become adherent to neighbouring muscles, or even to neighbouring muscle bundles, and, finally, œdema may persist within the muscle, similar to the œdema which so often persists in fractures of the leg before function is restored.

Active contraction may aggravate a partial tear of muscle—may even increase it. Therefore, if the tear be considerable, it is wise to operate and suture it, so that contraction of the muscle may be commenced sooner than would otherwise be possible. In minor injuries—strains—the harm that contraction does to the lesion is more than compensated for by its prevention of wasting and adhesions, and for this reason strains should be treated by exercises, aided by massage and heat. The harmful effect of the exercises upon the local lesion can be minimised by limiting excessive contraction by strapping.

There are a number of well-recognised conditions which come under the heading of strain, such as tennis elbow (one form at least), tennis leg, cricketer's thigh, and javelin thrower's arm, but I do not propose to describe them here.

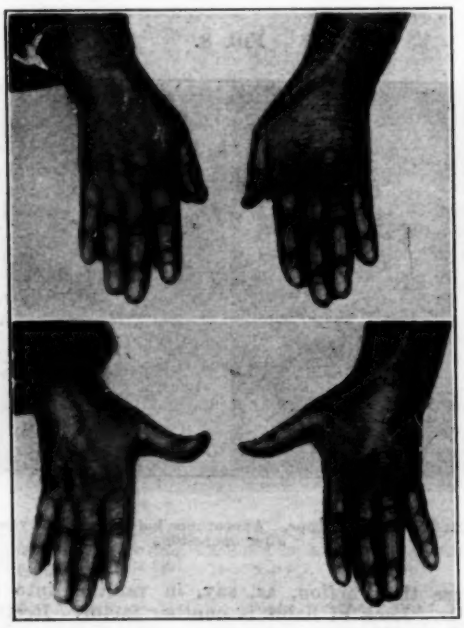
Complete rupture of a muscle or tendon from muscular injury alone is rare, there being only 15 cases out of a total of 18,950 surgical admissions into King's College Hospital. This figure perhaps exaggerates the rarity, as it is probable that a number of the cases seen in the out-patient department were not suited for admission. It has been pointed out that under normal conditions healthy muscle in a healthy subject should not be capable of inflicting injury upon itself. Predisposing causes must be looked for therefore in local conditions of the muscle and tendon, the general condition of the patient, and abnormal circumstances of contraction. Such factors may either diminish the threshold violence for rupture, or momentarily increase the contractile force of the muscle beyond its tensile strength.

LOCAL ABNORMALITIES OF MUSCLE AND TENDON.

Zenker's degeneration of enteric fever, which predisposes to rupture of the rectus abdominis, is well known. Ruptures of this muscle may also complicate severe influenza, as Abrahams and others [4] have shown. The degeneration of muscle in this disease is of a different type from Zenker's.

It is exceptional to find primary disease in a tendon predisposing to rupture. Melchior [5] describes a case of rupture of the finger extensors due to gonococcal tendovaginitis. In the museum of the Royal College of Surgeons of England there is a specimen showing gouty deposits within the long flexor to a finger near

FIG. 6.



its insertion. It is conceivable that such deposits may give rise to necrosis, which will lead to rupture.

The most striking example of pathological rupture of a tendon is that of the long tendon of the biceps in arthritis. A man of 54 had attended King's College Hospital with painful arthritis of the right shoulder for 18 months. There was little to see in the radiogram. Three days before the photograph (Fig. 5) was taken a lump suddenly appeared in the arm without any sudden symptom suggesting rupture

FIG. 5.

Rupture of the long tendon of the right biceps secondary to arthritis of the shoulder.

by violence. The lump is the belly of the biceps occupying a lower position in the arm following rupture of the long tendon. Meyer [6] has investigated the pathology of rupture of the long tendon of the biceps in dissecting no less than 13 specimens obtained post mortem. In these cases the disability is not great, and the distal portion gains reattachment to the humerus in the neighbourhood of the bicipital groove. No attempt at operative repair is advisable.

Previous injury may be a predisposing cause, the muscle or tendon being partially ruptured by this injury, the rupture being completed by a similar type of injury at a later date. In the case of tendons, the injury may cause degenerative changes which lead later to spontaneous rupture. The most striking example of this is rupture of the extensor pollicis longus after injury about the wrist-joint. The injury is usually a Colles fracture, but not invariably, for it may follow simple sprains of the joint. I am indebted to my colleague Mr. St.J. D. Buxton for permission to describe the following example.

A woman of 45 years sprained her wrist. Six weeks later she noticed that she could not extend her thumb. Operation showed a gap in the extensor longus tendon, bridged across by fibrous banks at the distal margin of the posterior annular ligament. Direct suture was possible, and a good result followed. Fig. 6 shows the condition two years later. Movement is perfect except that hyperextension to the degree possible by the right thumb is not present.

There is considerable microscopic evidence,[7] obtained at operation upon such cases, that the predisposing cause generated by the initial injury is a hyaline degeneration in the tendon, though it does not appear to have been proved whether such degeneration is the cause or the result of the complete rupture of the tendon. The break in extensor longus pollicis always occurs at or near the distal margin of the posterior annular ligament. This site of election is undoubtedly due to the abrupt change of direction of the tendon at this point when the wrist is dorsiflexed.

A history of previous injury is sometimes present in other ruptures, for example, the long head of the biceps, and Mr. H. A. T. Fairbank, who has kindly furnished me with the notes of several private cases of muscle rupture, permits me to mention the following example.

A man of 25 felt something go in the left arm when tackling a man at rugger. A bruise appeared to the outer side of the biceps. The arm got well, but showed some deformity.

Five weeks later the history repeated itself, and when seen three weeks afterwards it was obvious that the long tendon of the biceps had ruptured. At operation the long tendon was found curled up in a mass at the upper part of the fleshy belly, and was so firmly matted that no attempt was made to unravel it. It was sutured to the groove and adjacent tendons. The operation was completely successful

FIG. 7.

Apparent rupture of the tendon of insertion of the right biceps in a tabetic.

and the patient, who had been an Olympic swimmer, was chosen to play water polo for his county four months later.

Finally, occupational strain may predispose to rupture, as instanced by the Trommlersehne—drummer's rupture—of German literature.[7] The rupture is of the extensor longus pollicis, at the site of election already described. Other muscles and their occupational predispositions, as stated by various authors, are as follows :—

Thigh adductors in swimmers and riders.
Rectus abdominis in cavalrymen.
External oblique in reapers.
Pronator radii teres in lanceplay (javelin thrower's arm, an example of which is included in the King's College Hospital series).
Pectoralis major in climbing. The one case of rupture of this muscle in my series was sustained by a boxer, who over-reached on driving a right-handed punch at his opponent, who eluded it. The rupture was a partial one.
Biceps in glass blowers.

The contention that the wearing of high heels predisposes to rupture of the tendo Achillis is not borne out by the sex-incidence of this injury.

GENERAL CONDITION OF THE PATIENT.

Like bones, muscles and tendons appear to be more susceptible to injury as age advances. When a man past the athletic age indulges in some violent form of exercise, such as running the hundred, he puts a severe strain upon the integrity of his muscles and tendons. With one exception, all the cases of rupture of the quadriceps in King's College Hospital were over 50.

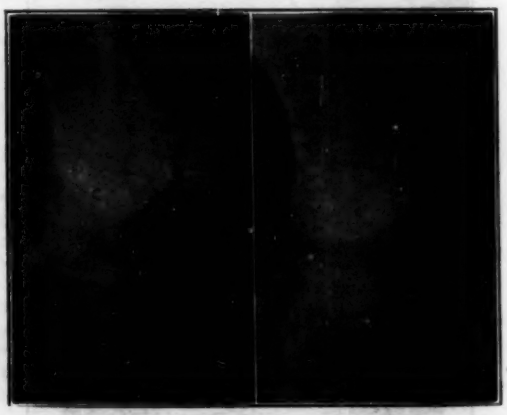
Many diseases are quoted as predisposing causes—arterio-sclerosis, rheumatism, typhoid, alcoholism,[8] and diabetes,[9] to mention a few, but there is lack of clinical evidence. Tabes dorsalis appears to affect tendons in the same little understood way that it does bones. Fig. 7 illustrates the case of a man of 50, who has been under treatment for four years for tabes.† He has been a boxer, hence his excellent physique. The lower tendon of the right biceps appears to have ruptured, but clinical examination shows it to be intact, but stretched. No scar can be felt. It gradually got like this, there having been no causal injury.

ABNORMAL CIRCUMSTANCES OF CONTRACTION.

How can we explain those cases of rupture of muscle and tendon in healthy subjects? The rarity of muscle rupture, even in the violent contractions of tetanus, supports the view I have already put forward, that healthy muscle in a healthy subject does not rupture from muscular violence alone. Some abnormal circumstance of contraction must be present, and this is usually created by the element of surprise, or fear, which may cause a brisk contraction of the muscle, which is entirely unconscious and involuntary. The surprise element may temporarily inhibit control, and the intensity of the contraction may be of itself sufficient to cause rupture. Such a surprise contraction may occur to prevent falling. The usual mechanism of rupture of the quadriceps is an example of this. A man coming downstairs slips as he placed his left, say, heel on the step in front. In order to prevent himself falling backwards, he involuntarily contracts the quadriceps of the leg behind (the right) to the full extent of its power, and this contraction, coupled with the weight of the falling body upon the bent right knee, results in rupture of the right quadriceps.

Each deliberate body movement is carried out by a synergic group of muscles. If, because of fear or surprise, one muscle involuntarily attempts to execute a movement ordained to be carried out by the group of which it is a synergic member, it may prove too feeble and break. Again, during forceful contraction of a muscle, or muscle group, to achieve some object, a sudden emergency situation may arise which causes the antagonists to contract briskly and involuntarily. This prevents the movement first started, and the muscle may rupture. The mechanism of contraction may be at fault. A muscle which normally acts from its origin may suddenly be called upon to reverse its action. The professional gardener is maintained in a stooping attitude throughout the working day by contraction of the recti abdominis, acting from the origin. He may rupture these muscles if he suddenly calls upon them to

FIG. 8.



14.1.26. 3.iv.30.

Rupture of quadriceps. Appearance before and four years after operation.

reverse their action, as, say, in vaulting into the saddle. Lack of habit is another factor. Recruits suffer injuries to muscles from comparatively trivial causes, which leave the trained soldier unscathed. It is well recognised by the management of professional football teams that it is an economy to spare no expense in the training of their teams, as the sick list from injury is thereby immeasurably reduced.

† I am indebted for this case to Dr. Macdonald Critchley.

The following illuminating sentence of Ombredanne [1] is an excellent summary of this aspect:—

"Somme tout, manque d'habitude de l'individu et manque d'habitude du muscle pour produire un mouvement inaccoutumé sont les causes premières de cette contraction anormale, incoordonée, déreglée, exagerée, qui aboutit à la rupture."

These explanations cannot be applied perhaps to all cases, and at best only touch upon a very complicated and elusive subject. A study of the mechanism of muscle rupture will, however, show that the element of surprise is usually a prominent feature.

Fig. 9.

RUPTURES OF SPECIAL MUSCLES.

The commonest ruptures are of the rectus femoris, the biceps humeri, and the tendo Achillis.

The *rectus femoris* has two sites of election: a high one at the junction of the muscle-fibres with the tendon of insertion, and a low one at its insertion into the patella. In the latter injury the lateral expansions might also be involved to a varying extent. The low rupture is the more serious lesion and always demands operation. Not infrequently the torn muscle carries away with it a small fragment from the upper margin of the patella, and this is all to the good, as it makes suture easier.

Fig. 8 shows an example of this injury in a man of 51, who slipped on a wet floor. The right leg went forwards, and the left quadriceps contracted to prevent falling. The left foothold also gave, and the foot slid backwards until it was arrested by coming into contact with a wall, and the rectus ruptured at its attachment to the patella, taking away a flake of bone. There was an interval of two months between the accident and operation. Four years later a small gap could still be seen between the small fragment of bone and the patella, but the functional result is excellent.

Fig. 10.

R. L.

Rupture of the right infrapatella and tendon five years after operation. Note the difference in level as compared with the uninjured side (L.)

Operation is advisable in recent cases of rupture of the rectus femoris at the musculo-tendinous junction, but is not essential, and in late cases should certainly be left, for the rest of the quadriceps compensates for any loss of power, and there is very little disability. Operation in late cases is not easy because of the difficulty in obtaining a suture hold in the muscular (proximal) portion. I should deprecate any attempt to restore the muscle by placing a fascial graft in the gap in late cases, for the muscle will have undergone shortening.

Fig. 9 shows this type of rupture in a man of 20, who ran up against a heavy opponent at rugger. He tried to bend the knee and felt something give. He has a somewhat confused memory of the accident, and the exact mechanism of the rupture is not clear. The illustration was made five months after the accident. It is now 18 months since the rupture, and the function of the leg is good, the patient playing rugger regularly without any appreciable handicap.

Fig. 11.

Rupture of the tendon of insertion of the biceps. Appearance two years after operation.

Infra-patellar tendon rupture is a rare injury and calls for early operation, which may be a matter of considerable difficulty, as the tendon usually ruptures near the bone. Gallie [10] recommends a reconstruction operation, using a slip from the tendo Achillis tendon, and has secured good results by his method in both early and late cases.

The case illustrated (Fig. 10) was that of a man of 52, who fell out of a trap and hyperflexed the right knee. At operation it was found possible to suture the tendon directly, and the result five years after operation is shown. Movements are full, but the muscles are weak and tire easily. The patella is higher on the affected side by ¼ths of an inch. This is due to stretching of the scar, in which some ossification has taken place.

The poor result obtained in this case is an argument in favour of the routine use of Gallie's operation for rupture of the infra-patellar tendon.

The *biceps* may rupture in any part of its course, and cases have been reported of rupture of the long tendon above the bicipital groove, in the groove, at the musculo-tendinous junction, through the belly, and of the tendon of insertion. Rupture of the short head may also occur. With the exception perhaps of the last named, operation is indicated in all cases in which there are no local predisposing causes, such as arthritis of the joint, but care must be taken in giving a prognosis in rupture of the long tendon cases who are unsuited to, or refuse operation, for the short head of the biceps is capable of considerable compensatory hypertrophy, and the resulting loss of function may ultimately be very slight.

Fig. 11 illustrates a case of rupture of the lower tendon of the biceps two years after operation. The patient is a man of 50, and was lifting a relative, who was having a fit, on to a couch. The body lay across his forearms held in full supination. As he lifted his burden, it suddenly started to slip, and he gave a sudden and involuntary lift up with the right arm and felt something give. At operation three days later the lower tendon of the biceps was found retracted and coiled up, having ruptured near its insertion into the radius. The proximal end was sutured to the supinator brevis fascia. As is evident from the illustration,

the scar has stretched, but function is good. He can carry heavy weights with the arm, and his only complaint is that he cannot use a walking stick.

Rupture of the *tendo Achillis* appears to be most common where the muscle-fibres end, which is the narrowest portion, and about 1¾ in. above the os calcis. The plantaris may rupture with it. It is surprising how trivial may be the cause of rupture of the tendo Achillis in older subjects. A man of 63 felt something give at the back of the right leg when stepping off a low curb, and a violent pain in the calf, as though struck from behind with a stick. Operation showed a complete tear of the tendon. The optimum treatment in all cases of complete rupture of this tendon is undoubtedly operation, and the case for conservative treatment is largely a relic of pre-Listerian days.

Partial rupture of the *gastrocnemius* is the usual form of tennis leg, and should be treated on the lines already suggested for minor injuries. The at-one-time popular theory that tennis leg is due to rupture of the plantaris tendon can, I think, be completely discredited, in view of the absence of any shred of evidence, either clinical or pathological, in support of it.

Riders' rupture—rupture of the *adductor longus*—varies from a tearing of a few fibres to complete rupture of the muscle at its insertion into the femur. Occasionally the adductor brevis ruptures, but rupture of the adductor magnus is rare. Operation should not be attempted even in complete ruptures of the adductor longus, as the break occurs so close to the bone that repair is practically impossible. Very little disability results from the injury, although excision of the muscle tumour caused by the loss of its insertion may be necessary at a later date.

Rupture of the *hamstrings* is rare, but through the courtesy of Mr. Fairbank I am able to describe the following case of complete rupture of the semi-membranosus in a man of 20.

There was a double injury at an interval of three years, both sustained at Rugby football. On the second occasion the patient was tackled by the left ankle, and felt something go above the left knee. At operation five weeks later, a scar was found in the semi-membranosus, with the healthy muscle belly below. Above the scar there were some pale, paralysed fibres, and above this again a short portion of healthy muscle. The scar was freed, divided, overlapped, and sutured. The belly of the muscle was sutured to the healthy fibres above. Ten months after operation the patient reported that he was playing Rugby again without any disability.

Ruptures of the *rectus abdominis*, apart from disease, are of particular interest because in a few cases operation has been performed on a diagnosis of acute appendicitis. The lesion in the muscle is usually a tear near its origin from the pubis. There is pain and tenderness to pressure, with local resistance and a tendency to nausea. The rupture occurs as the result of some sudden strain referred to the abdomen. Behan[11] describes the case of a patient who suffered this injury from opening a window with a jerk.

Mention must be made of muscle and tendon lesions around the shoulder-joint, which may be a cause of persistent shoulder pain after injury. The *supraspinatus* tendon appears to be the most frequently injured. Codman[12] states that he has no difficulty in finding a complete or partial tear of this tendon in the dissecting-room, and puts the incidence at 1 in 20 of the bodies dissected. This is certainly much higher than the clinical evidence in this country leads us to believe. Injury of the tendon is related to subdeltoid bursitis, and the physical sign of crepitus may be elicited. The two cases which I have seen of subdeltoid bursitis following injury, one in a rheumatic subject of 43 and one in a healthy girl of 22, both got well with physical treatment. In neither of these cases was there any X ray evidence of the presence of calcareous deposits about the tendon that sometimes complicates the injury.

Open Wounds of Tendons.

I shall confine my remarks to open wounds of the finger tendons, a subject which I conceive to be of very great economic importance. Table I. indicates the relative frequency of open divisions of the extensors and flexors of the fingers.

TABLE I.

—	Wrist.	Dorsum.	Thumb.	Fingers.	Total.
Extensors	10	13	2	27	52
Flexors ..	25 8 unaccompanied by nerve injury.	Palm. 11	4	11	51
			Total		103

Taken as a whole, wounds of the extensors do well after suture, but wounds of the flexors badly. How badly is shown by the figures in Table II.

TABLE II.—*Results in 34 Cases of Cut Flexor Tendons.*

—	No.	Good.	Fair.	Bad.	Untraced.
Wrist	8	4	2	2	0
Palm	11	2	2	7	0
Fingers	11	0	0	5	6
Thumb	4	0	2	2	0
Total ..	34	6	6	16	6

Out of 28 cases traced, therefore, the results are as follows: good, 21 per cent.; fair, 21 per cent.; bad, 58 per cent.

This summary of results agrees in the main with other authentic statistics.[13] The difference in prognosis between the extensors and flexors is due to the presence around the latter of a synovial sheath, with its delicate gliding mechanism. The cause of the failure in all cases was the formation of adhesions in and about this sheath, so that the tendon was anchored. If one knew how to prevent adhesions, good results could be obtained. What are the predisposing causes of their formation? I think they may be summed up as sepsis, bad operative technique, and prolonged immobilisation.

Sepsis.—Our control over sepsis is a limited one, yet much can be done to counter infection. Many of the cases included in Table II. were sutured in a casualty department immediately, under the mistaken view that urgency is essential. Such is not the case. The only two perfect results of division of the flexors in the palm were both sutured in the operating theatre three days after the injury, and after careful preparation of the skin. To minimise sepsis, therefore, operation should not be regarded as an emergency measure, but should be performed under ideal conditions after routine preparation of the skin.

Bad Technique.—The operation is not one really suited to resident hospital officers, but calls for experienced work. The actual method of suture is of extreme importance, the aim being to obtain as small a scar as possible. The method of "buried suture" suggested by Bunnell[14] is probably the best, the knots of the suture being brought to lie between the divided ends of the tendon.

Prolonged Immobilisation.—If accurate suture is

achieved, there should be nothing to fear from early movement, which may be commenced the next day. The movement must be active or assisted, for passive movements alone have absolutely no power to prevent adhesions. A splint must be worn except during treatment to prevent the tendency to flexion deformity, which is apt to occur. Finally, apart from the prevention of adhesions, movement is important in that by its means correct orientation of the scar in the tendon may be obtained from the outset.

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THE MECHANISM OF DIASTOLIC BLOOD PRESSURE.

A NEW CONCEPTION.

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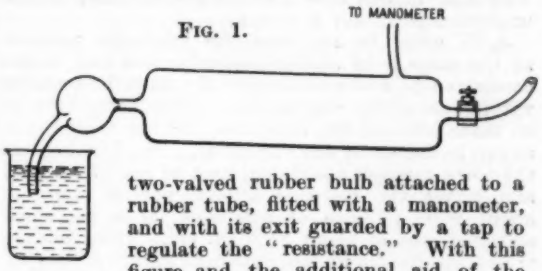
I PRESUME that the apparent simplicity of the conventional theory of the production of diastolic pressure, and the lack of any obvious alternative, is the reason for its appearance without material alteration in successive generations of physiological text-books ever since diastolic pressure became an accepted clinical fact. But anyone who, like myself, studies the literature of the subject, cannot avoid being impressed by the fact that physiologists, in assuming its accuracy, have frequently had great difficulty in satisfactorily accounting for circulatory phenomena. Their explanations have, indeed, been ambiguous and confusing. The purpose of this paper is to demonstrate that there may be another, and almost equally simple mechanism, which can account for all the associated clinical facts, and suggest solutions of problems which the other cannot solve.

The hydrodynamics of the circulation being a vast and intricate subject, I must try to set out my views as briefly and simply as possible, the facts on which they are based being more fully set forth, although differently interpreted, in the standard physiological text-books. Unfortunately these books only describe the mechanism of the circulation as it is believed to function in the fully developed adult anatomical "unit." For instance, the statement is made that the heart is a prime cause of blood pressure; whereas it is patent that pressure exists in the earliest embryonic days before the heart is formed. Embryological works are likewise disconcertingly silent or vague on the manner in which blood-vessels develop during the first few days after fertilisation of the ovum. So far as I am able to conceive of the sequence of pressure development, from the birth of the circulation, it leads me to an impasse if I accept the customary view, but easily fits in with the idea I am about to expound. For instance, how does the pressure start from zero and finally stabilise at the normal terminal diastolic pressure? But perhaps it were fitter that I should do no more than hint at the profound readjustment of orthodox views necessary should my theory be valid, and without further generalisations proceed to develop my argument.

Fig. I shows a piece of apparatus consisting of a

FIG. 1.



two-valved rubber bulb attached to a rubber tube, fitted with a manometer, and with its exit guarded by a tap to regulate the "resistance." With this figure and the additional aid of the graph, Fig. 2, I can demonstrate most of the points I wish to make clear.

THE CONVENTIONAL THEORY.

In the first place, for the sake of comparison, let us consider very briefly the mechanism of the conventional theory.

Fill the apparatus with water so that it is just about to escape from the up-tilted nozzle tip, and the intratubal pressure will be slightly above zero. For practical purposes, however, we may call it zero. We will assume that the capacity of the bulb is 65 c.cm., and that owing to the size and resiliency of the tube, and adjustment of the tap, if we empty the bulb by squeezing it in 0·3 sec., the manometer will show a rise of pressure to 50 mm. Hg. If the tube is then allowed to discharge its excess volume until zero pressure is reached, and the status quo ante is attained, the time required from the termination of the bulb compression to this point will be, say, 2 secs. ("diastolic period"). But at the expiration of 0·5 sec. the pressure will only have fallen to say, 30 mm. Hg. A total period of 0·8 sec. having therefore by now elapsed since we began to squeeze the bulb, we repeat this procedure, but owing to the additional volume and pressure in the tube we shall require extra force to overcome the resistance in 0·3 sec., and at the expiration of a further 0·5 sec. the pressure will be higher than at the end of the first "cycle," although the water has been escaping at a faster rate. After an indefinite number of these 0·8 sec. cycles, equilibrium is supposed to be established, and the intratubal pressure can be imagined to have been stabilised as we find it actually to exist in the human circulation and depicted on the graph (Fig. 2, NSEFMN).

OBJECTIONS TO THE CONVENTIONAL THEORY.

At this point I think it would be well that I should briefly indicate some of the more obvious objections suggested by this mechanism.

1. It is difficult to conceive how analogous conditions could obtain in the real circulation, during its birth.

2. It is pure assumption that the arteries really are distended at the end of diastole, their calibre at zero pressure never having been measured.

3. It is implied that the arteries are always distended by a pressure of at least 80 mm. Hg throughout life. This entails constant histological distortion of the walls, which by analogy with other vital tissues should result in structural change of a permanent and injurious character. Physiological activity requires proportionate rest.

4. A great part of the heart's energy is absorbed in overcoming the already partly distended arteries. If

it can be shown that it is possible to have the same clinical pressure readings, even if the vessels are completely relaxed at the end of diastole, so far as their elasticity is concerned, it would support the view that in this case also the conventional idea is unphysiological and unsound.

5. In order to maintain the minimum pressure at the same level at the beginning and end of the cardiac cycle, and also to keep the diastolic pressure within safe limits, very delicate adjustments have to be made between the resistance and the heart-beats, as can be shown by our apparatus. The blood enters the aorta through a sectional area of say, 7 sq. cm., and leaves the systemic arterial portion, through about 9000 millions of arterioles, of a combined sectional area of about 9500 sq. cm. These minute vessels are divided up into numerous groups of varying functional activity—e.g., renal, hepatic, muscular. Physiologists admit that local isolated groups influence the pressure but slightly, if at all. Therefore it is implied that the greater part of all these groups can so coördinate their various functions as to either permit of a steady heart-rate, or an abnormal one, without disturbing the pressure. If another factor can be shown to do this in a more practical way this will also help my argument.

6. The whole burden of propelling the blood during diastole is thrown upon the arterial elasticity under the usual scheme. The internal surface area of the arterial vessels alone has been computed at about 30 sq. metres. It is also estimated that these number about 17,000 millions, of various sizes and tortuosity, and hydrostatic elevation. In addition there is the hydrostatic "head" to be overcome at the arteriolar-capillary junction, representing the "resistance" of the capillaries and veins beyond this. It is immaterial whether the above figures are only approximately correct; surely it might reasonably be expected that a constantly falling "store" of elastic energy would be inadequate for this task, and would be better performed by an active muscular force, as I will suggest. It is useful to recall that the heart, with about 65 beats, passes into the arteries all the blood in the body.

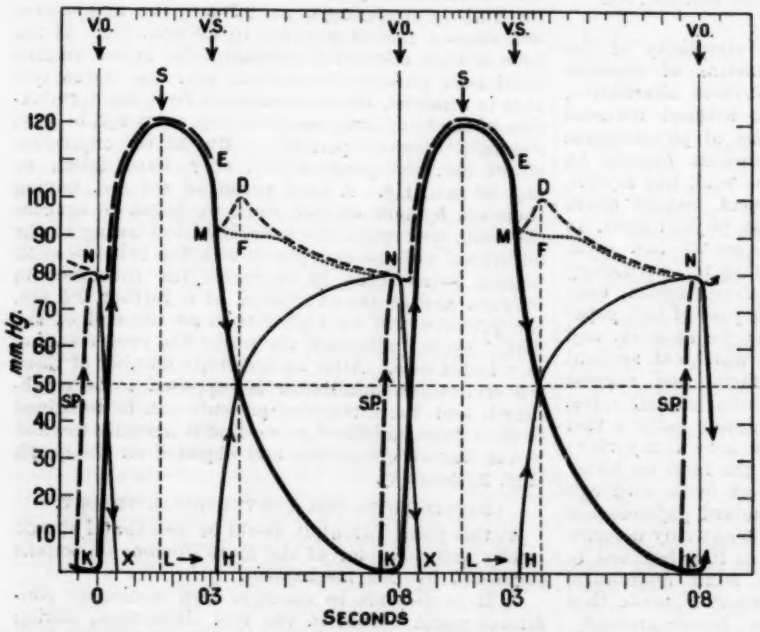
7. The only interpretation—viz., reflux effect—it permits of the dicrotic wave is extremely unsatisfactory (see later). Whereas if the phenomenon be regarded as the signal of the onset of muscular contraction (see graph), this would be strong corroboration of the correctness of my alternative theory.

DIFFERENT MECHANISM.

For present purposes this selection of (admittedly controversial) objections must suffice.

Let us now return to our rubber apparatus, the tube of which we will imagine to be of a rather less resiliency than in our first experiment, so that when the same volume as before is injected the pressure will rise to 120 mm.Hg exactly as shown on the graph; falling to 90 mm. at the expiration of 0·3 sec., when the injection ends and the valve closes. At this point I am prepared to admit that a very slight pressure notch might occur in the real artery owing to the reflux, but the analogy between the conditions in a rigid tube and an elastic one, as usually given in the text-books, is in my humble opinion misleading. A rigid tube cannot take up the vacuum formed between the tap and receding column of water when the former is turned off, hence the column tends to move back, whereas an elastic tube can at once recoil on the vacuum and so prevent return of water. I shall therefore assume that the falling pressure gradient from here to the end of the 0·5 sec. diastole will not take the form of the dicrotic wave, but follow the line MFN (Fig. 2) just below, until it has fallen to 80 mm. Hg at the end of the cycle. If the bulb were to contract then, the pressure would, of course, rise much higher in the ensuing cycle, if we assume that the sole cause of the diastolic pressure is due to the elastic recoil. Supposing,

FIG 2.



Graph depicting two successive normal heart cycles (0·8 sec.). The upper composite line, NSEMDN, corresponds to normal intra-arterial pressure.
Thick interrupted line, SPNSE = ventricular systolic pressure, reaching maximum at S and ending E. Portion SP = presphygmic rise, which does not affect intra-arterial pressure, merely serving to force valves open at N. V.O. = opening of valves. V.S. = closing of valves.
Thick continuous line = elastic pressure due to varying volume of blood. Portion K (zero) to E = while ventricle is acting. E to M = immediately after valves close. M down to K = curve resulting from added arterial muscular compression, accelerating evacuation.
Fine dotted line, MFN = course which would be taken by thick line if no muscular compression was acting.
Thin continuous line = pressure on arterial contents due to muscular coat, starting at H (zero) after latent period L→H, rising to N, where it serves to hold valves closed while SP is rising. Then dropping sharply to X (zero).
Thin interrupted line, MDN = resultant pressure curve of added muscular and elastic effects. D = dicrotic wave. M = incisura.
Note that the vertical line dropped from D intersects elastic curve at 50 mm. Hg, and the muscular at 50 mm. Hg, the total forces acting on arterial contents at this moment being 100 mm. Hg.

however, that at the end of "systole" (V.S.) I grasp the *tube* in my other hand and squeeze it with a gradually increasing force, represented in time and degree by the uprising gradient (HN). This force aiding the elastic tension will cause the fluid to be evacuated at a rate and time indicated by the line (MK), with the result that when the end of the "cycle" is reached the "compressional" pressure has risen to 80 mm., but the elastic fallen to zero, and so the artery regained its normal calibre. This cycle can be repeated indefinitely without change. Thus while the "intravascular" pressure has followed the same course as before, its *components* have changed, and the calibre of the artery diminishes faster than under the conventional theory.

Now if it be possible that the muscular coat can act like my fist, the whole scheme becomes feasible in the living circulation. We can assume that at the moment the ventriculo-arterial valves are about to open the arterial pressure is at 80 mm. Hg, not because of elastic tension, but owing to muscular compression, and that as soon as the ventricular pressure has superseded this the arterial muscular contraction rapidly relaxes to zero. This can be effected in our rubber model by retaining the squeeze on the tube with our right hand until the bulb compression is started with our left. This muscular relaxation permits of the *undistended* artery being equally rapidly refilled. The effect is shown in the graph. The ventricle thus injects its contents under the best possible conditions. The slight fall at the beginning of the normal pressure curve (N) may be due to this.

The muscular force starting at H, after a period of rest from X, commences to act on the pressure curve MF at M, and it will be seen that the former rises in about 4/50 sec. to 50 mm. Hg, while owing to the increased rate at which the fluid has escaped during this time, the elastic curve MK has fallen 40 mm. from 90 mm. to 50 mm. Hg. Therefore, as 50+50= 100 mm., the original line MF has risen 10 mm. to form the dicrotic wave (D).

When the tube is grasped as described, a bulge will form against the edge of the fist, and if this be slid along the tube, while compressing it, the bulge will advance ahead of it. If an increasing band of muscular contraction were to advance from the root of the aorta towards the periphery a similar bulge or wave would arise and show on a volume tracing like a dicrotic wave. It is obvious that if the artery is in active muscular contraction during cardiac diastole any risk of over-distension is impossible. As the growth of the muscular coat in the embryo would proceed pari passu with the development of peripheral resistance, there is no need to assume terminal diastolic arterial distension at any period of life; hence there is no need to think that arteries are more immune than other tissues to injury from histological distortion.

The usual stimulus to contraction of the involuntary coats of hollow viscera is stretching. The circulatory system is a hollow viscus. It is suitably stretched at each ventricular systole. Assuming it responds by contracting to this, it would do so in proportion to the force of the stimulus and its own irritability. A consideration of this possibility leads one to think that this is a more useful and practical way of controlling pressure than modifications of the arteriolar exit. It also opens up new therapeutic avenues.

GENERAL CONSIDERATIONS.

Is there any experimental evidence that arteries act in this manner? Although for many years I had conceived that this might be possible, it was only about two years ago that I came across a paper published by L. E. Bayliss nearly 30 years ago (*Jour. Phys.*, 1902, xxviii., 231), entitled The Local Reactions of the Arterial Wall to Changes of Internal Pressure. In this he says:—

> "The muscular coats of arteries react like smooth muscle in other situations to a stretching force by contraction . . . this force is myogenic in origin, as this result can be obtained in situ and in excised portions of the arteries. . . . When pressure is suddenly increased the artery appears to wriggle like a worm."

The experiments were performed on dogs' carotids. Those interested should refer to the full text. This seems to indicate that my views are not fantastic.

The latent period of smooth muscle is notoriously slow. The available period on our graph is from the summit of the systole curve to the point where the dicrotic wave starts—viz., nearly 0·2 sec.—which appears to be regarded as the minimum possible for smooth muscle in other localities. The arterial muscle is not quite comparable to, say, intestinal muscle; in certain areas, especially in the large vessels, it approaches the cardiac muscle in type, and possibly the latent period is shorter than imagined. I am not aware of any recent work on the excitability of arterial muscle which necessarily negatives my assumption that the available latent period is sufficient. Further there is some doubt in my mind whether the stimulus should not be regarded as commencing before the systolic summit is reached, and if so the period would be extended. Histologists inform us that the relative amount of muscular tissue in the arterial walls gradually increases towards the peripheral vessels in contrast to the elastic. This should be expected if the stored ventricular energy becomes less effective as the distance from the heart increases and requires muscular reinforcement in the manner I am suggesting.

The dicrotic wave is most marked in the medium-sized arteries, where the muscular action would be most evident and least in the elastic aorta where one would expect a valvular reflux wave to be most marked. Schiff's rhythmic pressure "rises" could be explained as a periodical elevation of the threshold of arterial excitability, although the cause of this periodicity remains uncertain.

The scheme allows for complete elastic relaxation once per cycle, rest for the musculosa during the cardiac systole, and conservation of cardiac energy and histological structure. In view of all the foregoing is it reasonable to assign to the arterial muscular coats no other function but that of maintaining that nebulous state called "tonus"?

When I was a student the idea of active capillary contraction would have been absurd. Veins were, and are still, regarded by clinicians as mere fibrous conduits, although anyone in the habit of injecting varicose veins knows how irritating the active contractile response to the needle can be. Hence the gods may have been caught napping once more; and my view that we must consider the existence of a new and even more important circulatory propelling force than the heart may not be so preposterous as might appear at first sight.

Egham, Surrey.

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ACUTE RHEUMATISM AND THE SEDIMENTATION RATE.

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THE sedimentation rate of the red blood corpuscles varies with the health of the subject. It is no more specific of any disease than is a raised temperature; and, like variations in temperature, it can indicate both the presence of disease and the progress of an illness. The following preliminary note shows how the sedimentation rate changes with the varied progress of acute rheumatism in children.

TECHNIQUE.

In most of the methods for performing this test the quantity of blood required necessitates venous puncture; but as children do not tolerate repeated venous puncture at all well, a simple method was devised requiring only 0·4 c.cm. of blood which can easily be obtained, after a little practice, from one stab of the finger pulp.

The apparatus required is a pipette graduated at 0·1 and 0·5 c.cm.—an ordinary straight 1 c.cm. pipette graduated in 0·01 c.cm. is quite suitable—a small glass capsule or test-tube, a block of wood with a lump of plasticene stuck firmly on it, and finally some thin glass capillary tubing with an internal bore of between 1·6 and 1·9 mm. This is cut into lengths of about 12 cm. and a mark is made exactly 10 cm. from one end.

A solution of 3·8 per cent. neutral sodium citrate in water is the only reagent needed. 0·1 c.cm. of this solution is sucked into the graduated pipette and the finger is then stabbed, the blood is collected straight into the pipette by capillary action until full to the 0·5 c.cm. mark. The citrate and blood are then discharged into the glass capsule, mixed and sucked up into the pipette again. One of the capillary tubes is now stuck horizontally on the plasticene and the blood is run into it up to the 10 cm. mark. Still keeping horizontal the tube is pushed into the lump of plasticene which thus seals the lower end of the tube and without withdrawing the tube from the plasticene it is rotated into the vertical position and the time noted. The level of the blood is now above the 10 cm. mark owing to the plug of plasticene pushing it up. After standing it will be seen that the red cells have fallen leaving a clear column of plasma. The height of this clear column is measured in mm. after one hour and if desired again at 2 and 24 hours. The first hour measurement gives sufficient information, but in severe cases the reading at the end of half an hour is instructive. The reading at one hour is normally from 3 to 6 mm. and values over 10 mm. can be considered abnormal.

The following precautions must be observed:—

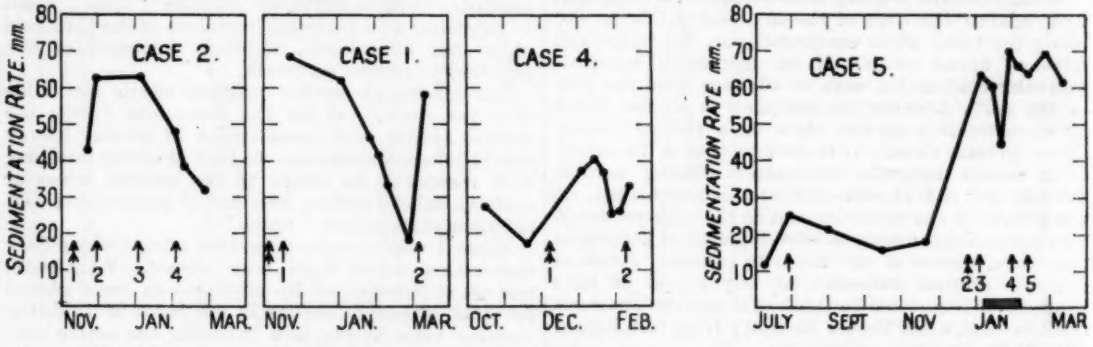
Temperature.—The optimum temperature is about 18° C., the rate of sedimentation increases with rise of temperature but only slowly up to 25° C., after which a more rapid rate of increase begins. It is sufficient to keep the tubes standing away from sources of heat and in summer to place them in a shady cool corner of the room.

Position.—The tubes must be kept vertical after setting up. If it is necessary to transport the blood it is well to do so in a small stoppered tube after mixing with citrate and to put it into the capillary tube later. This will not alter the result providing the delay does not exceed five to six hours.

Glassware.—The collecting pipettes should be cleaned in the same manner as a blood count pipette; the capillary tubes cannot be satisfactorily cleaned and are discarded. It is important to avoid dust or grease as these are liable to cause air bubbles in the capillary tube which must be got rid of.

RATIONALE.

While the variations in viscosity and specific gravity of the plasma have some small effect, the two most important factors involved are the number of red cells and the protein content of the plasma. Anæmia will cause an increased rate of sedimentation, as can be shown by diluting the blood with its own plasma; but given a normal number of red cells the plasma is the controlling factor. The same washed red cells will sediment rapidly in plasma obtained from a diseased person and normally in normal plasma, providing no agglutination occurs from incompatibility. The rate of sedimentation in a suspension such as red cells in blood depends largely on the size of the particles involved—e.g., mist and rain—and anything that causes the red cells to agglutinate and form larger units increases the rate of sedimentation. Broadly speaking, anything that allows the red cells to lose their electric charge will allow them to agglutinate. The plasma fibrinogen and to a lesser extent the plasma globulin are both proteins which tend to allow the red cells to discharge their electricity but the plasma albumin acts in an opposite manner. An increase in the fibrinogen or a decrease in the albumin-globulin ratio will therefore tend to increase the sedimentation rate and one or both of these changes are usually found in practice when the sedimentation rate is increased. It is probable that the site of these changes is in the liver, which is the sole source of fibrinogen and probably the main source of the other plasma proteins and also of the circulating antibodies which are linked with the euglobulin fraction of the plasma.



RESULTS.

Dr. W. Sheldon and Dr. W. R. F. Collis have recently reported[1] an epidemic of tonsillitis in a group of children convalescing from rheumatic fever. It so happened that a series of sedimentation tests were being made at the hospital at that time and the

[1] THE LANCET, 1931, i., 1337 and 1341.

opportunity was taken to follow up some of the cases infected. The following cases, illustrated in the Charts, are selected from the series showing the results obtained. The arrows represent points of clinical interest (usually febrile disturbances). The double-headed arrows represent the "initial fever" in Sheldon's table. The shaded area represents the periods during which aspirin was given.

CASE 1 (Sheldon's Case 19).—Period 0–1: sore-throat, Oct. 11th, 1930; tonsillitis, Nov. 1st, and fluctuating temperature. Point 1: pericarditis. Period 1–2: progress steady; pulse-rate falling. Point 2: temp. 101° F.; pulse-rate rising; throat red; bronchitis.

CASE 2 (Sheldon's Case 20).—Point 1: tonsillitis; temp. 101° F.; pulse-rate raised. Period 1–2: quiescent; pulse lower; temp. normal. Point 2: relapse; temp. 101°; pulse-rate raised. Period 2–3: two attacks of fever with lung involvement. Period 3–4: no further attacks, but occasional slight rise of temp.; pulse-rate falling. Period 4 onwards: slow improvement.

CASE 3 (Sheldon's Case 23).—Point 0–1: doing well; temp. normal; pulse-rate becoming steadier. At 1: sore-throat; aspirin grs. x. t.d.s.; temp. 102°; pulse-rate raised. Period 1–2: temp. normal; pulse-rate as in period 0–1. Point 2: aspirin omitted; pulse-rate rose; nodules developed; no carditis. Period 2–3 onwards; pulse-rate more rapid than in period 0–1 but steady progress made. Point 3: slight pyrexia.

CASE 4 (Sheldon's Case 26).—Period 0–1: steady improvement; temp. normal; pulse-rate falling. Point 1: tonsillitis; temp. 102° F.; pulse-rate up. Period 1–2: no relapse; steady improvement. Point 2: rise in pulse-rate, ? cause.

CASE 5 (Sheldon's Case 28).—Period 0–1: very slow improvement. Point 1: unexplained slight pyrexia. Period 1–2: slow improvement. Point 2: rise of temp. Point 3: further fever; carditis developed; aspirin started. Period 3–4: quiescent. Point 4: rise of temp. Period 4–5: slight intermittent fever and temp. 99° F. Point 5: temp. 101°; aspirin omitted few days before. Period 5 onwards: intermittent temp. 100·5°.

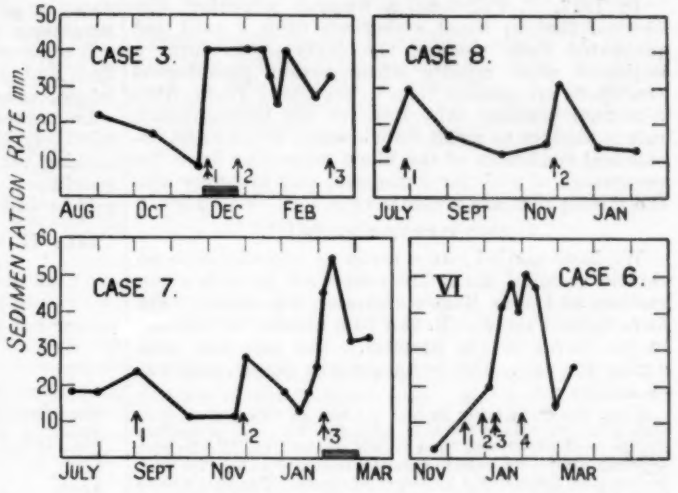
CASE 6 (Sheldon's Case 29).—Period 0–1: condition improving. Point 1: slight fever. Period 1–2: quiescent. Point 2: relapse; temp. 101° F.; pulse-rate raised; pain in knee. Period 2–3: quieter. Point 3: temp. 101°; throat red. Period 3–4: temp. normal; pulse-rate a little higher than period 0–1. Point 4: temp. 101°; pains in forearms; pulse-rate unchanged. Period 4 to end: temp. normal; improving; pulse-rate falling.

CASE 7.—Aortic and mitral disease. Period 0–1: settling down after several relapses. Point 1: erythema marginatum; slight temp. Period 1–2: progress good except for a few days unexplained rise of pulse. Point 2: slight temp., 99·4° F., for several days. Period 2–3: progress maintained; sitting up. Point 3: temp. 103°; pulse-rate raised; throat red but not sore; aspirin. Period 3–4: no further fever; pulse-rate falls until aspirin omitted, when rise occurred.

CASE 8.—Mitral and aortic disease. Period 0–1: steady improvement since February, 1930. Point 1: slight unexplained rise of temp., 99°, and rise of pulse-rate. Period 1–2: steady improvement. Point 2: slight fever; slight rise of pulse-rate. Period 2 and onwards: doing well.

It will be seen that there is a close relation between the clinical findings and the sedimentation rate. Almost every variation in the sedimentation rate can be shown to have a corresponding clinical counterpart. In three of the cases aspirin was given; as pointed out by Sheldon, in this series some of the cases receiving aspirin appeared to have been benefited by it, but on leaving off the drug the pulse-rate rose and further cardiac damage was manifest. It will be seen that in two such cases (Nos. 3 and 5), although there was temporary clinical improvement, no improvement in the sedimentation rate was shown.

In practice the test is of use in several ways. The most obvious and probably the most useful is in gauging the progress of a patient, especially in diseases of long duration such as rheumatism and tuberculosis. It gives a reliable numerical index to the progress,



good or bad, and thus enables a more certain valuation to be made of the efficacy of any line of treatment. Again its failure to return to normal gives an indication of the persistence of some active pathological process. It is hoped that as more data become available the sedimentation rate will prove to be a useful guide in determining the presence or absence of an *active* cardiac lesion. Also in the after-care of these children it should give an early indication of impending trouble.

My thanks are due to Dr. Collis and Dr. Sheldon for their cordial coöperation, to Dr. Sheldon for granting me access to his cases and notes at Cheyne Hospital, and especially to the sister and staff of the ward at Cheyne Hospital in which the work was done for the considerable amount of help they have given me.

ERYTHROCYTE SEDIMENTATION RATE IN RHEUMATIC FEVER.

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RHEUMATIC fever may be looked upon as a specific disease which may manifest itself to the clinician in several ways. It may appear as acute rheumatic arthritis, chorea, rheumatic carditis, and in many other less easily recognisable forms. The clinical diagnosis may be difficult, and is dependent on the elucidation of rather indefinite symptoms and signs. In any particular case when the diagnosis has been made, the line of treatment that is indicated depends on whether or not the disease is "active" or quiescent. There are certain investigations which are of value in making and substantiating the diagnosis of the disease, and are of assistance in following its course,

Amongst these the weight, the temperature, and the pulse-rate, the blood leucocyte count, the electrocardiographic finding, and the erythrocyte sedimentation rate are of real interest. It is in connexion with the last of these that the present paper is written.

In 1917, F. Fahraeus, a Swedish physician, discovered that in blood withdrawn from a vein and prevented from clotting the erythrocytes form a sediment more rapidly when certain pathological conditions are present than in the blood drawn from a normal person. Alteration of the sedimentation rate is thought to result from changes in the chemico-colloidal conditions of the blood depending upon the percentage of globular fibrinogen, and probably also the lipoids that are present.

THE INVESTIGATIONS.

We have carried out a series of investigations on certain children under treatment for juvenile rheumatism at Queen Mary's Hospital, Carshalton. We have applied the E.S.R. test to a number of children in the wards of the hospital. The test was done during the day. The technique was simple, and was as follows:—

From the child lying in bed 1 c.cm. of blood was withdrawn from a vein in the arm, added to 0·2 c.cm. of sodium citrate, well mixed, and then drawn up into the Westergren apparatus, which consists of special capillary tubes (2·5 mm. in bore) held vertically in a special stand. The tubes were then left at room temperature in the ward. At the end of one and of two hours the degree of sedimentation was ascertained by reading the lower level of the clear supernatant fluid. The figures indicate the length of a column of clear plasma above the settled erythrocytes, the end point being, in practice, a clear-cut line.

In our experience the figures for normal people are usually under 10 mm. at the end of the first hour and under 20 at the end of the second hour, though distinctly lower readings are usually met with in healthy persons.

The cases in col. 1, Table I., with readings higher than 30 for the first hour, 60 for the second hour, were all cases exhibiting definite and unquestionable evidence of active rheumatism; almost all had some degree of pyrexia, and showed such signs as a pericardial rub, severe chorea, or developed rheumatic nodules, if the more classical picture of acute juvenile rheumatism was not present. The cases in col. 3 and 4 with readings of 7 for the first hour and 23 for the second hour and less were, with two exceptions, regarded as quiescent. Most of these cases were known to have been definitely active at some previous date, or showed signs of cardiac damage strongly suggestive of previous rheumatic infection.

The cases with readings of less than 30–60 for the first and second hours respectively were, on the whole, cases that would be regarded as quiescent when examined, but amongst them there were a relatively high proportion of patients who were not making very satisfactory progress, were not gaining weight or, generally, doing so well as those in cols. 3 and 4.

TABLE II.—*Erythrocyte Sedimentation Rates; Serial Readings Taken on Six Boys.*

—	—	A.			B.	
	1	2	3	4	5	6
	1st 2nd hr. hr.	1st 2nd hr. hr.	1st 2nd hr. hr.	1st 2nd hr. hr.	1st 2nd hr. hr.	1st 2nd hr. hr.
Nov., 1930		80–124				
Dec., ,,		11–27		25–50	8–14	
Jan., 1931	55–67	10–26	126–136	30–62	—	
Feb., ,,	48–75	—	—	—	—	4–6
March, ,,	—	—	—	—	—	—
April, ,,	11–26	—	53–83	37–67	6–17	6–18
May, ,,	5–15	4–11	3–10	18–46	8–22	7–15
June, ,,	4–10	6–12	—	4–12	4–5	—
July, ,,	8–21	—	7–18	—	—	—
August, ,,	4–10	12–32	9–23	14–36	—	—

Table II. has been compiled to show the type of readings that we obtained.

The cases in Table II. are divided into two groups—Group A, those that were "active" at the commencement of the investigation and tended to become "quiescent"; and Group B, those that appeared to be "quiescent" throughout. Two cases may be recorded as typical.

CASE 1.—A boy, aged 13, began to have rheumatic pains about 14 weeks before admission, and definite chorea about ten days before admission. When he was examined on Dec. 23rd, 1930, the chorea was of a severe type, and

TABLE I.—*Rheumatic Children.*

One hundred consecutive readings of the erythrocyte sedimentation rate (E.S.R.) for the first and second hour.

Presence of clinical signs of active rheumatism A +. Absence ,, ,, ,, ,, A −.

Presence of clinical signs of organic heart disease B +. Absence ,, ,, ,, ,, ,, B −.

Case No.	E.S.R. 1st hr.	E.S.R. 2nd hr.	A.	B.	Case No.	E.S.R. 1st hr.	E.S.R. 2nd hr.	A.	B.	Case No.	E.S.R. 1st hr.	E.S.R. 2nd hr.	A.	B.	Case No.	E.S.R. 1st hr.	E.S.R. 2nd hr.	A.	B.
1	126	136	+	+	26	16	41	−	−	51	7	25	+	+	76	5	15	−	−
2	118	129	+	+	27	16	37	+	+	52	7	23	−	+	77	5	14	−	+
3	80	124	+	+	28	15	40	−	−	53	7	20	−	+	78	5	13	−	−
4	78	102	+	−	29	15	35	−	+	54	7	18	−	−	79	5	11	−	+
5	64	96	+	+	30	14	42	−	+	55	7	18	−	+	80	5	7	−	+
6	63	108	+	+	31	14	36	−	+	56	7	17	−	−	81	4	13	−	−
7	53	83	+	+															
8	48	75	+	+	32	13	37	+	+	57	7	17	−	+	82	4	13	−	−
9	45	76	+	+	33	13	29	+	+	58	7	16	−	−	83	4	12	−	+
10	43	80	+	+	34	12	23	+	+	59	7	15	−	−	84	4	11	−	+
11	37	72	+	+	35	12	21	+	+	60	7	15	−	+	85	4	10	−	+
12	37	67	+	+	36	12	21	−	−	61	6	24	−	−	86	4	10	−	+
13	32	64	−	+	37	11	32	−	−	62	6	22	−	−	87	4	10	−	+
14	30	62	+	+	38	11	29	−	+	63	6	21	−	+	88	4	10	−	−
15	30	60	−	−	39	11	28	−	+	64	6	21	−	+	89	4	9	+	−
16	28	50	+	+	40	11	27	+	+	65	6	20	−	+	90	4	6	−	+
17	26	60	−	−	41	10	26	+	+	66	6	18	−	+	91	3	10	−	−
18	24	59	−	+	42	10	24	+	+	67	6	18	−	+	92	3	9	−	−
19	24	44	−	−	43	9	28	−	−	68	6	18	−	−	93	3	9	−	−
20	24	43	−	−	44	9	24	−	+	69	6	17	−	+	94	3	8	−	+
21	22	46	−	+	45	9	23	−	+	70	6	17	−	−	95	3	8	−	+
22	19	44	+	−	46	8	24	−	+	71	6	16	−	+	96	3	7	−	+
23	18	46	−	+	47	8	22	−	+	72	6	15	−	+	97	3	7	−	−
24	17	42	−	+	48	8	21	−	+	73	6	15	+	+	98	3	6	−	−
25	17	40	−	+	49	8	19	−	−	74	6	12	−	+	99	3	6	−	−
					50	8	14	−	−	75	5	15	−	+	100	3	5	−	−

a short blowing systolic murmur was found to be present at the apex. The sedimentation readings for January and February were 55–67 and 48–75 respectively. The condition then improved, and by March the patient was free from chorea and had gained about half a stone in weight. During the remainder of his stay in hospital he made satisfactory progress, and the sedimentation rates remained low.

CASE 2.—A boy, aged 12, had a history of recurrent attacks of acute rheumatism, almost yearly since 1923, for which he had received a certain amount of hospital treatment. On admission in November, 1930, the temperature was 103° F., both knees were swollen and painful, and the ankles and wrists had been swollen during the 24 hours prior to admission. There were signs of endocarditis, probably of long standing. A pericardial rub was present a few days after admission, and the sedimentation rate taken about a fortnight after admission was 80–124. There was a fairly steady improvement in this boy's condition, and a steady gain in weight. This was accompanied by a fall in sedimentation rate. The pericardial rub was of short duration, though the murmur of valvular origin remained unchanged throughout.

The cases in Group B, Table II., were all boys who gave histories of acute rheumatism at some time, but who were clinically quiescent during the period of the investigation. They all showed evidence of organic heart disease.

It seems from these figures that the sedimentation rate is high when there are clinical signs of active rheumatism, and low when the disease is quiescent. The rate is apparently uninfluenced by the degree of cardiac damage that is present.

CONCLUSIONS.

As the result of this investigation we consider that when the clinical picture is that of juvenile rheumatism in an active phase, the blood sedimentation rate is definitely raised; when it is that of quiescent rheumatism or rheumatic heart disease unassociated with clinical signs of activity, the rate approaches normal limits. We feel that further and detailed examination may show that the E.S.R. is of real value in diagnosis of now doubtful cases.

As the result of our clinical experience we have taken as a normal figure, below 10 mm. at the end of the first hour, below 20 at the end of the second hour as the erythrocyte fall as estimated by the Westergren method. In those cases which showed definite clinical signs of active infection the rate varied from 126 to 30 at the end of the first hour, and 136 to 60 at the end of the second hour. In those cases showing no clinical evidence of active infection the reading varied from 9–3 at the end of the first hour, and 20–5 at the end of the second hour.

In a series of cases in which the sedimentation rate was taken at regular intervals during the child's stay in hospital the readings showed that as the active phase subsided the blood sedimentation rate tended to fall.

From these preliminary tests we feel that further investigation should be carried out to determine whether or not the blood sedimentation test should be included with the weight, the temperature, and the pulse-rate in the routine investigation of the rheumatic child. In practice in dealing with rheumatic children we suggest that in a child with a sedimentation rate of 11–21 or over active disease should be suspected in the absence of the usual clinical signs indicative of activity. If there is no clinical evidence of other infection, such as acute rhinitis or sinusitis, the presence of a definitely raised sedimentation rate may be taken as sufficiently suggestive evidence to necessitate the treatment of the case as one of active infection.

In our opinion this test is of value in the consulting room as an aid to the initial differentiation between active and non-active juvenile rheumatism which in practice means the decision as to whether or not the child shall be nursed in bed. It is also of value, if estimated at regular intervals during the course of treatment, in deciding when the active infection has subsided and if the child should be allowed to get up. If the sedimentation rate remains above normal limits special precautions should be taken, and this usually indicates that the child should be kept in bed until the E.S.R. falls. If the E.S.R. is persistently low, there is little danger in allowing the child to resume a normal life.

PEPSIN THERAPY OF GASTRIC AND DUODENAL ULCER.*

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THE great importance of hydrochloric acid in the genesis of the peptic ulcer, upheld by numerous experimental tests, is also proved by clinical experience—e.g., (1) the site of origin can only be where the gastric hydrochloric acid has access; (2) in a healing, cicatrising ulcer the hydrochloric acid content usually decreases; (3) by removing the pyloric portion of the stomach together with the antrum, we achieve a permanent achylia, thereby preventing a recurrence of the peptic ulcer. Since, therefore, hydrochloric acid is the sine qua non for the genesis of the ulcer, the exciting cause must be sought in some local disposition which may be quite trifling: a small hæmorrhage or an embolus of a small end-vessel of the gastric mucous membrane with necrosis. Such small local sites of irritation may appear as a consequence of the most various injuries: toxins (nicotine), infections (anaphylactic injuries such as have been observed by the Italians[1] after injections of horse serum), nerve lesions (vagus injuries), and local and cerebral arterio-sclerotic changes, which Hart states can bring about such disturbances.

I pointed out these causes as far back as 1912, and later, in 1921 at the Congress of Natural Philosophers in Leipzig, I was able to show that we can succeed in producing artificial ulcers of the skin and of the mucous membranes by injecting gastric hydrochloric acid intracutaneously or intramucously. I produced genuine ulcers in rats, guinea-pigs, and rabbits by this means. After intramucous injection a pustule first appears with clear, then cloudy contents; a necrosis develops and the dead tissue falls off in about ten days, giving place to a roundish ulcer with a flat or deep base and slightly upturned rims, healing with a scar in about four weeks. Such intramucous ulcers take root with far greater difficulty in that portion of the stomach which has covering cells than in the region of the main cells—the central portion, for instance—a sign that cell disposition also plays a part, and that antipepsin is perhaps confined to certain cells. Guinea-pigs are the best subjects for intracutaneous experiment. The experimental skin ulcers, if left to themselves, required four to six weeks for healing, but if a neutral pepsin solution was injected subcutaneously, healing was much more rapid; a fully developed ulcer retrogressed after a fortnight. The chief idea was that the pepsin did not act as a simple irritant but—being the strongest

* Read before the Medical Society, Vienna, on June 19th.

ferment of the human body—was an external, and probably also an internal, hormone of the covering cell gland which we call the stomach.

The gastric juice of normal persons and of ulcer patients differs biologically. If, for instance, the gastric juice of a normal individual is introduced beneath the skin of a guinea-pig, a slight necrosis will result; this will become a rapidly spreading extensive ulcer if the gastric juice of an ulcer patient is added. The process can be shown still more distinctly on the cornea of experimental animals, in which an erosion painted with ulcer gastric juice takes much longer to heal than an erosion painted with normal gastric juice.

PEPSIN THERAPY.

I have made these facts the basis of a clinical treatment of ulcer and E. Moser,[2] of Zittau, verified my experiments.

This subcutaneous pepsin therapy, which I have now been practising for about five years, entailed much important preliminary work. To begin with, pepsin cannot be sterilised, as a ferment loses its effectiveness at a temperature of above 36°. This was a most difficult problem, the more so as the ferment researchers persisted in maintaining that enzymes do not pass through a filter and that a filtered pepsin solution must be ineffective. This, however, is not the case. Filtering pepsin through porcelain filters under pressure renders the solution free from albumin, but it does not lessen the ferment contents. Thus the pepsin was freed from germs by porcelain filtration; at the same time an antiseptic (diluted carbolic acid) was added to keep the filtered solution free from germs. Absolute neutrality is essential, for the slightest variation will cause local injuries on the skin which render treatment very difficult. Injections of pepsin solutions prepared by my method are harmless and painless. Sometimes, to be sure, larger doses produce certain—probably anaphylactic—phenomena: swelling and reddening of the skin and of the hypodermic cell tissues, slight rises of temperature, and a feeling of fatigue; and occasionally we have observed local exanthemata. But these reactions are exceptional and easily avoided by careful, individual dosage. That the pepsin action is not an albumin action is shown by the facts that the therapeutic effect is lost by boiling and that the filtered solution is free from albumin.

METHODS OF APPLICATION.

I have—after long experience—evolved the following formula. Twice in a year the patient receives a series of 30 injections, increasing and decreasing. The Austria Pharmacy in Vienna† has, for the last two years, put on the market ampoules ready for use. I begin with 0·2 c.cm. and give three injections either daily or every other day; after three injections I increase to 0·3 c.cm.; after three further injections to 0·4 c.cm., after three further injections to 0·5 c.cm. I stop at 0·5 c.cm. for 12 injections, then decrease again to 0·4 c.cm. three times; 0·3 c.cm. three times, and 0·2 c.cm. three times; the series ends at 0·2 c.cm. If anaphylactic symptoms appear, it is wise to use the next lower dose and proceed again; but it is also quite possible to stay consistently at a lower dose without any increase.

Up to date I have treated more than 600 cases, mostly in hospital or ambulatory; ambulatory treatment is quite possible, as the therapy need not interfere with work. Gastric and duodenal ulcers represent the chief material. The new therapy was applied to all ulcers which offered no strictly surgical indication—e.g., stenosis, perforation, severe perigastritis, sudden hæmorrhage under certain conditions, or suspected carcinoma. Œsophageal and jejunal ulcers were also treated. We left gastric hæmorrhages without treatment for three weeks before beginning injections.

I am able now to give a report of about 130 cases which were observed in my ward; we had 23 gastric and 105 duodenal ulcers and two jejunal ulcers. These cases were examined as follows: acid values determined, patient X rayed, weight taken before and after treatment, examination of stools; in many cases neutral red evacuation and test of local sensitiveness to pressure; finally, the subjective feeling (pain, fullness, heart-burn regurgitation of food) was registered. The determination of the acid values, of weight condition, and X ray examination before and after treatment gives a good picture of the great effectiveness of the therapy.

(*a*) In 50 out of 94 thoroughly examined cases the acid values decreased, and in 44 cases they remained stationary or even increased; this strange result has nothing to do with the effectiveness of the therapy, save that it shows that the potentiality of ulcers still exists, the danger of a relapse being imminent. In these cases a repetition of the therapy is necessary, for only when the acid values—particularly the value of the free hydrochloric acid—decrease steadily can the condition be regarded as cured or clinically latent. It is interesting that in cases of ulcer with low acid values an increase was frequently noticed; it was just these cases that exhibited a particularly good healing tendency.

(*b*) The weight was accurately examined in 94 cases; eight cases remained constant (8·8 per cent.); six cases showed a decrease of weight which varied between 0·5 and 2·5 kg. (6·2 per cent.); on the other hand, 80 cases (85 per cent.) showed an increase of weight which amounted to 14 kg. We were also able to achieve increase of weight by the use of pepsin in other cases where weight was lost.

(*c*) It is difficult to explain the changes in the radiographic findings, since changes in the mucous membrane surface are frequently irreparable, even if the ulcer is healed. However, I was able, upon the absolutely objective examination by our radiologist at the hospital—I never undertook this examination myself—to establish positive improvement in 72·4 per cent. This improvement consisted either in the disappearance of sensitiveness to pressure; in normal formation of the duodenal cap; in disappearance of niches and filling defects; and in better evacuation. In 27·6 per cent. the radiogram remained unchanged. In a great number of cases the highly important six-hour residue had disappeared.

(*d*) The neutral red test was made in a great number of cases. Here, also, the prolongation of the time of secretion was an important criterion of improvement. In cases where the time of secretion had not decreased, the series of injections was repeated. The procedure is very easy: injection of 5 c.cm. of a 1 per cent. neutral red solution and examination of the gastric juice of the empty stomach with the duodenal probe. Normal individuals evacuate the pigment after 15 minutes, ulcer patients in a shorter time, cases of hypochlorhydria in a longer time, and achylics not at all (Glaessner and Wittgenstein). About 70 per cent. of the cases showed a reduction of the time of evacuation.

(*e*) Occult blood soon disappeared under the treat-

† Vienna, ix., Währingerstrasse, 18.

ment. In 11 cases of very severe hæmorrhage the blood disappeared from the stools.

(*f*) The blood picture before and after the pepsin injections showed a gradual increase of value, even in cases of severe hæmorrhage. I found in general an increase of the eosinophils up to 8–10 per cent., and a leucopenia at the expense of the lymphocytes—I sometimes found 3–5 per cent. of lymphocytes. Perhaps pepsin, like certain albumoses, produces the eosinophilia.

(*g*) The subjective phenomena improve very soon. Disappearance of pain is often observed after six or seven injections. The sensitiveness to pressure diminishes; the feeling of fullness, the repeating of food, the heart-burn, the pain at night and from hunger, the painful sensation of the empty stomach, all relax. The patients are rarely refractory; about 5 per cent., in spite of the cure, still had pain. Only five of our 130 cases went to the surgeon (4 per cent.).

Even if the patient makes no complaint, I am in favour of repeating the treatment twice in the year for two years; relapses occur sometimes. I have seen from 10 to 15 per cent. of relapses which were to be attributed to the fact that the patients were hospital cases belonging to the labouring classes and could not follow my directions. In cases which do not improve promptly we suspect other processes—e.g., cholecystitis, lymphogranuloma, tuberculosis and other affections of the pancreas, and cancer.

(*h*) Besides the injections the following factors are part of my routine: before meals the patients take olive oil, about 50 c.cm. per day (five tablespoonfuls), and after meals a bismuth preparation; bismuth carbonate, "bismoterran," or bismurated magnesia have proved satisfactory. All belladonna preparations are avoided and other drugs—sodium bicarbonate in particular—are cut out. If there has been no hæmorrhage or inflammation the patients have a mixed diet, the customary milk and fasting cures in particular being avoided. We give them mixed milk and cream and whipped cream. Sugar and honey agree with some patients, but not with all. They can also have eggs, soft cheese, milk dishes, vegetables of all kinds passed through a strainer, mashed potatoes, rice, hashed white meat, fish, and farinaceous food well greased. Soups should be prepared of vegetables or cereals; small quantities of bacon, unsweetened cooked fruit, toasted bread, or zwieback (rusks), and alkaline waters should be given. The quantity of each article of food is about 100 g., but the patient should always feel satisfied; he therefore takes numerous small meals—six a day.

Besides the injection treatment, medicines, and diet, a few physical measures deserve consideration—e.g., lying on the right side after eating, thermophore or mud packing, and daily stools (bismuth preparations).

RESULTS.

It is not easy to state the results of the treatment in figures. In the following table only objective factors are stated.

Cases observed, 130; operated on, 5 (4 per cent.); severe hæmorrhage, 11 (9 per cent.).

Of 94 fully investigated cases—

Acid values	Unchanged or higher	44 (47	per cent.)
	Lower	50 (53	„ „)
X ray findings	Unchanged	26 (27·6	„ „)
	Improved	68 (72·4	„ „)
Weight	Unchanged	8 (8·8	„ „)
	Reduced	6 (6·2	„ „)
	Increased	80 (85	„ „)

Besides gastro-duodenal ulcers, jejunal, œsophageal, and other ulcers may also be favourably influenced by pepsin injections. Mucous membrane ulcers of the mouth and pharynx rapidly improve, while ulcers of the lower leg and of decubitus granulate in a surprisingly short time. Similar observations were made by Moser, who achieved complete cures of radiographic ulcers. The ulcers of diabetics and nerve patients retrogress quickly, and we have seen a few most encouraging cases of ulcerative colitis. In pernicious anæmia we have likewise had encouraging results with pepsin injections. Here the pepsin probably acts as a gastric mucous membrane extract, like "ventæmon" or "stomopson."

In 1930 Loeper, Debray, Michaux, and Mlle. Sainton published [4] an article entitled Le traitement de l'ulcus par les injections hypodermiques de "Pepsin" in which, ignorant of my publications as far back as the year 1927, they record a small number of cases in which the cure of gastric or duodenal ulcers was effected by pepsin injections. In the following year (1931) [5] I claimed my priority, which Loeper and his collaborators were obliged to acknowledge. Nevertheless, the article of the French authors is a complete confirmation of my statements and results, and it is pleasant to think that investigators completely independent of each other should arrive at the same satisfactory results.

Recently W. Hertzer published a thesis [6] which treats of experiments carried out at Kuttner's instigation in the Rudolf Virchow Hospital in Berlin; The author records 12 cases in which he tested my method; in all these, save one, he achieved the same results as I, and even more favourable ones. After 20 injections of pepsin all the patients were free from pain and trouble; the increase in weight varied between 2·6 and 6·4 kg.; the acid values were—as in the patients under my observation—somewhat increased in a few cases while in others they changed little or became subnormal; the X ray findings showed a striking improvement and were pathological after the cure in only two cases; the blood disappeared in all cases. No medicine was administered besides the injections, and a normal diet was given. During the treatment no complications occurred, and except in one case no local reactions or fever were ever observed. The treatment was carried out with the pepsin injections prepared by the Austria Pharmacy in this city, according to my directions. This is a splendid proof of the effectiveness of the therapy.

SUMMARY.

Pepsin injection therapy can, in about two-thirds of the cases of uncomplicated duodenal and gastric ulcer, bring about an objective and subjective cure. Of the last 100 cases which were observed, more than half showed an improvement of the acid values, about three-quarters one of the X ray finding, and four-fifths one of the weight curve. Remittent treatment is recommended; in addition, only indifferent medicines and a plentiful diet are prescribed. Only 6 per cent. of the cases had to undergo operation. Other ulcer formations also (mucous membrane, skin, decubitus, intestinal) may be cured by this treatment. It is a specific therapy and depends more on hormonal factors than on the action of irritants.

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LOW SPINAL ANÆSTHESIA.

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Low spinal anæsthesia—or to give it its academic title, intrathecal caudal anæsthesia—consists in the injection of a suitable drug into the subarachnoid space so that the resulting anæsthesia is limited to the caudal region. Its use is therefore confined to operations involving the perineum, and it has a wide application in those gynæcological, genito-urinary, and rectal operations which take place in this area. During the past two and a half years I have used this form of anæsthesia in about 600 cases at St. Mark's Hospital and elsewhere. In the majority of these the operation has been for rectal conditions such as hæmorrhoids, fissures, and fistulæ.

TECHNIQUE AND MANAGEMENT.

The technique varies somewhat according to the anæsthetic agent employed. As Howard Jones [1] has said, "The movement of injected solutions is determined by their relative weight." If, therefore, a solution of higher specific gravity than cerebro-spinal fluid is introduced into the spinal canal it will at once tend to sink. This fact can be demonstrated by injecting a solution such as 10 per cent. stovaine in saline into a patient lying on his side. If the patient is allowed to remain on his side after the injection, his lower leg will become anæsthetic and paralysed and the upper one will be unaffected. It follows that for low spinal anæsthesia produced by means of a heavy solution, the patient should adopt the sitting posture during and for a short time after the injection, so that the solution may gravitate downwards and act only on the sacral nerves. If, on the other hand, it is decided to use a solution of lower specific gravity, such as percaine 1 : 1500 or 1 : 1000, the patient should, after injection, be placed prone in the horizontal position or with the head of the table slightly lowered.

In nearly all my cases I have used 10 per cent. stovaine in saline, and am now using it as a routine. Although this has for many years been called the "light" solution it has a specific gravity of 1080 and, besides being heavier than cerebro-spinal fluid (average specific gravity 1007), it is also heavier than the so-called "heavy" solution which contains 5 per cent. stovaine with 5 per cent. glucose in distilled water (specific gravity 1023).

The patient is given a preliminary narcotic injection about three-quarters of an hour before operation. On arriving in the anæsthetic room he is asked to sit up and place his feet on a stool at the side of the table. The skin over the spinal column is prepared by painting with iodine and the patient is asked to bend forwards. An injection of novocain (1 per cent. or 2 per cent.) is given intradermally and subcutaneously over the most convenient lumbar intervertebral space. Although the space between the fourth and fifth lumbar vertebræ is the site for choice it may be difficult to locate, especially if the patient is stout. In these circumstances it is often easier to palpate the spines of the third or the second lumbar vertebræ and to inject in the space below. I have also given the injection between the fifth lumbar vertebra and the sacrum.

The spinal needle is then inserted in the middle line. As soon as it enters the theca, and the cerebro-spinal fluid runs freely, an injection is given of between 0·4 and 0·5 c.cm. of the stovaine solution. The injection is made slowly to avoid unduly mixing the stovaine with cerebro-spinal fluid. After the needle is withdrawn the patient remains sitting for about two minutes. This allows time for the stovaine to gravitate downwards and act only on the lowest sacral nerves. The patient can then be placed on his back and wheeled into the theatre.

By the time the patient has been moved to the operating table, placed into position, and prepared for operation, anæsthesia is usually complete. In most cases five minutes is ample time between the spinal injection and the first incision, though it occasionally takes two or three minutes longer for complete anæsthesia to develop. The patient may be conscious of deep pressure at the start but this rapidly disappears.

If the area of anæsthesia is tested it is found that usually the only nerves to be affected are the third, fourth, and fifth sacral. This means that a saddle-shaped area of anæsthesia is present in the perineum and the patient retains complete sensation in and the full use of his legs. Sometimes the second sacral nerve is affected also and a band of anæsthesia is found at the back of the thigh reaching as far as the popliteal space. There is also anæsthesia of the penis and scrotum, though this may be only partial if the second sacral nerve has remained unaffected. With still higher anæsthesia the foot becomes numb and the patient speaks of tingling in the legs even if full anæsthesia does not occur.

As a general rule, the higher in the lumbar region that the injection is given, the more extensive will be the area of anæsthesia. If the stovaine is introduced between the fifth lumbar vertebra and the sacrum it is highly improbable that any nerves above the third sacral will be affected. If, however, it is given in the second or third lumbar interspace there is usually some anæsthesia and paresis in the legs. Area of anæsthesia will also vary with the dosage. An injection of 0·3 c.cm. of stovaine may limit anæsthesia to a small area round the anus which, while it may permit an operation for hæmorrhoids to be performed, is insufficient for the treatment of a large fistula in ano. An injection of 0·4 c.cm. appears to be the best dose for rectal operations, while for genito-urinary work it is as well to give 0·5 c.cm. to ensure blocking the second sacral nerve. Nor is the area of anæsthesia always symmetrical. It oftens happens that the third sacral nerve is the highest affected on one side and the second is paralysed on the other; or one leg may be partially anæsthetised and the other not at all. In no case, however, has anæsthesia been high enough to operate on an inguinal hernia.

With anæsthesia confined to the sacral region only a small portion of the sympathetic nervous system is involved and consequently there is no drop in blood pressure. The patient need not have his head lowered, and many of my cases have enjoyed the use of two pillows during operation, thus having the level of the head higher than that of the abdomen. There is no pallor nor faintness, nor have any of the patients complained of the nausea and sickness which is commonly found in those who have had the whole abdomen anæsthetised by means of spinal anæsthesia. Any action which the stovaine may have in producing toxic symptoms is completely absent in this form of anæsthesia, and in no case has the patient's condition given cause for concern.

A bandage is usually placed round the patient's eyes before entering the theatre, though many prefer to do without it. In any case there is little to be seen by a patient lying in the lithotomy position. One

patient, seen in private practice, was content to read his morning paper while his hæmorrhoids were being removed. Absence of apprehension has been a striking feature of this method.

POST-OPERATIVE CARE.

As there is no drop in blood pressure it is not necessary for the patient to lie with the foot of the bed raised on blocks when taken back to the ward.

Two precautions are taken against the occurrence of post-operative headache. Firstly, the injection of anæsthetic is made with a fairly fine spinal needle (standard wire gauge 20), and the bevel of the needle is made to face laterally while puncturing the dura mater. This is the method advocated by Labat [2] to reduce the size of the puncture hole and thus minimise draining away of cerebro-spinal fluid. Secondly, the patient is, on his return to the ward, encouraged to lie still for the rest of the day and not more than one pillow is allowed.

Post-operative headache has been comparatively rare among these cases, and as far as I have been able to ascertain has not lasted for more than a few hours when present. When it does occur, the patient should be made to lie flat, preferably without a pillow, and aspirin or phenacetin should be given by mouth. It is interesting to note that among 24 cases described by Spencer [3] in the United States only one case of headache is recorded, although the patients were allowed to get up and go home an hour or two after having their operations performed under low spinal anæsthesia. The exception, a man of 26, "left the office at 10.30 P.M. with instructions to go home to bed. He did so, but arose again at 1.30 A.M. and drove a milk wagon for several hours."

Only one other complication has occurred among these cases. I refer to an occasional instance of retention of urine. It is difficult to estimate the part, if any, played by spinal anæsthesia in causing this as it may also occur after perineal operations when the patient has had a general anæsthetic. A useful preventive measure is to encourage the patient to attempt micturition every hour for the first three or four hours after operation.

ALTERNATIVE ANÆSTHETIC AGENTS.

In addition to the 10 per cent. stovaine in saline I have also used the solution composed of 5 per cent. stovaine and 5 per cent. glucose in distilled water. It appears to work equally well and I have usually injected 0·7 c.cm. as the dose. Silverton,[4] in Sydney, employs an even smaller dose of this solution. He found that 2 cg. (0·4 c.cm.) of stovaine was enough to provide anæsthesia for cystoscopy and most perineal operations, and that 3 cg. (0·6 c.cm.) was necessary for litholapaxy and perineal prostatectomy.

I have also used a solution of percaine 1 : 1000 with 5 per cent. glucose added to raise the specific gravity of the solution. An injection of this (2 c.cm.) gives a satisfactory perineal anæsthesia but it does not appear to have any advantages over 10 per cent. stovaine in saline. The anæsthesia takes rather longer to develop. If plain percaine 1 : 1500 is used an injection of 5 or 6 c.cm. is necessary and this again takes a few minutes longer to act than stovaine. It is probable that for low spinal anæsthesia percaine, when used, should be in greater concentration, and Howard Jones [5] advocates the use of 0·5 to 1·0 c.cm. of 1 : 100, or 1 to 2 c.cm. of 1 : 200 solution. This may produce anæsthesia for as long as six to eight hours. The only advantage of such a prolonged action would appear to be in diminishing the need for post-operative sedatives.

In the United States, Pitkin [6] and McCormack have employed low spinal anæsthesia in obstetrics. Finding that the use of spinocain was impracticable they substituted glucose for the alcohol and increased the strength of novocain in the solution from 10 per cent. to 40 per cent. Their heavy solution is on the market under the name of Gravocain and, with such a concentration of novocain, the addition of glucose seems unnecessary to make the solution heavier than cerebro-spinal fluid. Spencer [3] has also used this, chiefly for genito-urinary work. It has been his practice to perform minor perineal operations on patients in his surgery after which they may return home within an hour or two, walking if necessary.

I have not used simple solutions of novocain for low spinal anæsthesia, but it would no doubt prove perfectly satisfactory for those who prefer this drug to stovaine. I have found stovaine so extremely efficient for this form of anæsthesia that I hesitate to make a change.

CONCLUSIONS.

From the foregoing remarks it will be seen that low spinal anæsthesia may be employed with advantage for a large variety of operations. Among these are the following: circumcision, operations for stricture, such as internal urethrotomy and the passage of dilators, cystoscopy when an anæsthetic is required, litholapaxy, diathermy to bladder or prostate, perineal prostatectomy, operations for hæmorrhoids, fissures, and fistulæ, insertion of radium into carcinoma of the rectum, and in the operative treatment of rectal prolapse. Pitkin has also used it in obstetrics and for dilating and curetting the uterus. In the last-mentioned operation he found that dilatation of the cervix was painless but that curettage of the uterine fundus caused some discomfort. It is not suitable for operations on the testicle, as this organ is not supplied by the sacral nerves.

Low spinal has certain definite advantages over other forms of anæsthesia. The nausea and vomiting which occur after a general anæsthetic are absent, nor does the patient require to be watched while the effect of the anæsthetic is passing off. There are no circulatory and respiratory disturbances such as are caused by the administration of a general anæsthetic. If tests for renal function are being carried out by intravenous injection of indigo-carmine, there is no delay in the excretion of the dye such as occurs when the patient is under general anæsthesia.

Lundy [7] and Buie,[8] both of the Mayo Clinic, strongly urge the claims of caudal and trans-sacral blocks for surgery of the perineum. Used by itself caudal block anæsthesia takes longer to develop and, in my experience, causes more discomfort to the patient than a spinal injection. Moreover, the anæsthesia produced is not so profound as with a spinal anæsthetic and a certain percentage of failures is usual. If a trans-sacral block is given also, good anæsthesia results but greater time is required for administration. Nor can the anæsthetist hope to become proficient in the technique of producing a trans-sacral block without considerable practice. Low spinal, on the other hand, is easy to administer, rapid in action, almost painless to the patient if given with care, and provides a profound anæsthesia for the area of operation. There is no drop in blood pressure and the patient's sense of wellbeing is not disturbed as with higher forms of spinal anæsthesia. With careful administration it should be successful in every case, and so far I have seen no case out of 600 where anæsthesia was unsatisfactory and had to be supplemented.

The views of two surgeons who have had considerable experience with this form of anæsthesia may with advantage be quoted here. Milligan,[9] says:

"Low spinal, or spinal anæsthesia limited to the sacral nerves, has advantages which render it of the greatest value for operations on the perineum. It is reliable . . . It is a controllable anæsthetic and has none of the disadvantages of the higher spinal anæsthetics. . . . The administration of the anæsthetic is simple and is quickly carried out. It is not unpleasant to the patient and is convenient to the operator if he is skilled in the technique. Anæsthesia is complete in two or three minutes. Apprehension before operation can be abolished by suitable injections. For hospital work it is ideal."

Silverton,[4] in New South Wales, says: "This is, as it were, an example of an almost perfect form of regional anæsthesia induced with great rapidity by a very simple technique."

SUMMARY.

1. For operations on the perineum low spinal is a very satisfactory method of producing anæsthesia. 2. It is easy to administer, rapid in action, and provides good anæsthesia limited to the area of operation. 3. There is no drop in blood pressure, and the condition of the patient remains good throughout. 4. These advantages should be applicable to 100 per cent. of cases.

I wish to express my thanks to Mr. W. B. Gabriel and Mr. E. T. C. Milligan for their coöperation in this work, and for kindly offering their criticism of this paper.

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ON A DIVERGENCE BETWEEN THE BIOLOGICAL AND GAMMA RAY EFFECTIVENESS OF RADIUM TUBES.

BY S. RUSS, D.SC. LOND., AND G. M. SCOTT.

From the Barnato Joel Laboratories, Middlesex Hospital.)

IN radium therapy use is made of many types of tubes and needles of varying degrees of screening; they are generally made of platinum, but occasionally of other metals, such as silver, lead, brass, or monel metal. Whatever the metal may be, the question often arises—what is the optimum thickness? This does not seem to be an easy question to answer. The object of this note is to draw attention to the fact that platinum radium tubes of the *same* normal gamma ray output will have a varying biological range of effect, which does not simply depend upon the degree of gamma ray absorption by the platinum.

In order to illustrate the point in question reference will be made to tubes of only three thicknesses—2·0 mm., 0·6 mm., and 0·3 mm. of platinum. These tubes were all the same length (2·0 cm.), and their specifications are given in Table I.

It will be seen from this Table that the actual content of the three tubes does not vary much, but there is naturally a marked difference in the gamma ray activity of the three tubes, due to the difference in screening. The tube with walls of 0·3 mm. is 5 per cent. more active than that with walls of 0·6 mm., and the one with 0·6 mm. walls is 18 per cent. more active than that with 2·0 mm. walls. This difference in the gamma ray effectiveness of these tubes would be measured in any physical laboratory where gamma ray measurements are carried out with an electroscope with walls of not less than 3 mm., the thickness calculated to allow only gamma rays to enter.

TABLE I.—*Details of Tubes.*

Tube.	Wall thickness of platinum.	External diameter.	Actual radium content.	Gamma ray activity.
A	2·0 mm.	5·0 mm.	3·00 mg.	2·42 mg.
B	0·6 „	2·2 „	3·08 „	2·87 „
C	0·3 „	1·6 „	3·14 „	3·03 „

It is common knowledge that gamma rays, like X rays, when incident upon material substances cause electrons to be emitted, and the gamma rays passing through the platinum tubes will cause streams of beta rays to issue from the tubes; but the ordinary gamma ray measurements obviously take no account of this. Such beta rays constitute an easily absorbed type of radiation which, although it is not detected by the gamma ray electroscope, will have a marked effect on the tissues within a limited zone around any tube or needle.

Ionisation measurements have been made with tubes of the three different thicknesses of platinum mentioned above to find out how far this easily absorbed radiation would extend into the tissues. An ordinary cubical electroscope (with 10 cm. sides) made of thin aluminium foil (0·18 mm.) was used, so that any ionisation produced by easily absorbed radiation would be measured, as well as that due to the primary gamma rays.

The central axes of the tubes were set vertically 18 cm. from the electroscope, and comparisons made between the actual ionisation measurements obtained and the ordinary gamma ray measurements. The tube with a 2 mm. wall thickness was used as a basis for comparison with the other tubes, and the amount of ionisation registered per mg., after allowing for the absorption by the 2·0 mm. platinum walls of the tube, was decided on as 100 per cent.; similar ionisation measurements of the other tubes were then compared with this. It was found, after the necessary absorption allowances, that the tube with a wall of 0·6 mm. platinum gave 113 per cent. ionisation, and the 0·3 mm. tube 145 per cent. to 165 per cent. The variation in this latter figure was due to the fact that the wall of the 0·3 mm. tube was not

TABLE II.

Platinum tube walls 0·6 mm. Radium 3·08 mg.			*Platinum tube walls 0·3 mm.* Radium 3·14 mg.*		
Thickness of paraffin.	Ionisation (per mg.) compared with— that of same tube unscreened.	that of 2·0 mm. platinum tube.	Thickness of paraffin.	Ionisation (per mg.) compared with— that of same tube unscreened.	that of 2·0 mm. platinum tube.
	Per cent.	Per cent.		Per cent.	Per cent.
Nil ..	100	113	Nil ..	100	165
1·4 mm.	104	117	1·7 mm.	94	155
3·4 „	104	117	3·7 „	82	135
5·4 „	98	115	5·7 „	74	122
7·4 „	97	114	7·7 „	68	111
9·4 „	88	103	9·7 „	64	105

* For all these observations the thinnest side of the tube was kept directly facing the electroscope.

uniform; as this tube was turned round the vertical axis the ionisation figures varied from 145 per cent. to 165 per cent.

As these data showed that if the tubes with walls of 0·3 mm. platinum instead of 2·0 mm. were used biologically, as much as 65 per cent. more radiation might come into play, the lightly screened tubes were coated with paraffin of almost as great a density as the soft tissues of the body, and observations were made to see how much paraffin was needed to obtain the same percentage ionisation effect with these tubes as that given with tubes with walls of 2·0 mm. Table II. shows these ionisation figures.

These observations show that to reduce the percentage ionisation of these tubes to the level of that from the 2·0 mm. platinum tubes, about 1 cm. of paraffin wax (density 0·93) is needed; the equivalent thickness to this in the softer tissues of the body would be about 9 mm. This contributory radiation of easily absorbed type gives these tubes a biological effectiveness quite apart from the smaller absorption of the primary gamma rays that is entailed.

Recently Sven Benner [1] and Piccard and E. Stahel [2] have shown that there are significant differences in the degree to which beta rays are emitted from different metals under gamma irradiation. It may be that some of the excessive reactions that have been noted when lightly filtered tubes have been used can be explained to some extent on these lines. This does not mean to imply that differential action may not also be looked upon as an explanatory factor.

[1] Acta Radiol., 1931, xii., Fasc. 4.
[2] Strahlentherapie, 1930, xxxvi., 347.

CLINICAL AND LABORATORY NOTES

A SOURCE OF ERROR IN MEASUREMENTS OF URINE SECRETION,

INCLUDING RENAL EFFICIENCY TESTS.

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AND

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IN many of the tests of renal function used in medical practice, failure to empty the bladder completely will lead to gross discrepancies. While this danger is well recognised, it is commonly regarded as an unusual complication, and as associated only with recognisable causes of obstruction. In studying records of urinary secretion, in which each specimen passed over long periods of time was measured, we have found figures which suggest that incomplete emptying of the bladder is not uncommon and that it occurs in the absence of any obvious cause of obstruction. It has therefore seemed worth while to publish these observations so that an appreciation of the importance of this factor as a source of error in such determinations may be more generally recognised.

Some patients with nephritis were observed to pass 150–350 c.cm. of urine within an hour of having previously passed urine. This second specimen was not dilute, but had approximately the same specific gravity and chloride, creatinine and protein concentrations as specimens passed before and after. This behaviour was noticed in four out of 16 cases in which records were kept of each specimen of urine passed over a period of several weeks. In one patient, this happened 24 times in 13 weeks; in the others more rarely. There was no reason to suspect retention of urine in any of these patients, and it did not occur to us at first that such was the probable explanation of the phenomenon. We regarded it as a sudden and temporary increase in the rate of urine secretion. Diuresis without dilution is unusual, and we therefore tried to reproduce it in these patients by various means—e.g., by giving them strong tea; urea by mouth, both in small and in large doses; 100 mg. ephedrine hydrochloride orally; 1 mg. histamine subcutaneously. Our efforts were entirely unsuccessful. Subsequently exactly similar occurrences were observed twice in a patient who was found to have a urethral stricture. It was also recorded twice in a patient with no evidence of any renal lesion; a man with a gastric ulcer who was on a very fluid alkaline diet and who passed about 2500 c.cm. of urine a day. It therefore appeared that the probable explanation of all the cases was a failure to empty the bladder completely on one occasion, causing urine to be voided again after a smaller interval of time than customary. The prone position in which micturition takes place in bed may well be the sole reason for the incompleteness of the act, of which the patient is quite unconscious. No sex difference was apparent from our records. We consider that incomplete emptying of the bladder affords a rational explanation of the large difference frequently seen in renal efficiency tests done at short intervals on patients who are in a stationary clinical condition. This is the more likely since in renal efficiency tests the collection of small specimens is carried out at small intervals of time.

A RECORD OF AN ATTACK OF MANIA.

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MEDICAL SUPERINTENDENT, PERTH DISTRICT ASYLUM, MURTHLY.

THE following case of acute mania (manic-depressive insanity) is interesting, first, because one rarely has the opportunity of seeing such an attack from the onset to the recovery, with a complete blood chart, and secondly, because it is still rarer to isolate an organism from the blood, which in this case gave a positive skin reaction.

The patient, a man of 40, had previously been in this hospital, suffering from an attack of melancholia with suicidal tendencies, from which he made a good recovery and had been discharged six months ago. He felt ill, and fearing another mental attack he placed himself voluntarily under care and was admitted on March 4th. On admission he looked flushed and anxious and he complained of mental confusion and an inability to sleep. Beyond a pulse-rate of 100 per minute and slightly exaggerated tendon reflexes he presented no marked physical symptoms.

March 5th: He slept very little last night and to-day was confused and constantly talking. 6th: Did not sleep at all last night and to-day was very excited and in a condition of delirium with vivid hallucinations of sight and hearing. 7th: Slept for two hours under the influence of paraldehyde. The delirium and the hallucinations continued.

Blood culture.—35 c.cm. of blood were taken from the median basilic vein and distributed between four flasks of nutrient broth.

March 8th: Still labouring under delirium, but he had several short lucid intervals. 9th: He had four hours natural sleep last night, but even when sleeping he constantly talked just as if he was in a condition of mania in his sleep. 10th: A very definite mental improvement. 11th: Steady mental improvement. 12th: Now sleeping well and mentally clear but exhausted and easily tired. 16th: Practically recovered.

He went home on March 18th.

Bacteriological findings.—A very spare growth of short streptococci was found in each of the four flasks. The growth was pure in flasks Nos. 2, 3, and 4. The first flask was contaminated with staphylococcus. No subcultures could be obtained from the streptococci.

A vaccine made by adding 5 c.cm. of the contents of flask No. 2, mixed with an equal quantity of a 0·5 per cent. carbolic acid solution in normal saline was used as a vaccine to test the skin reactions. The patient gave a very strong positive. The controls were as follows: all volunteers, one from the hospital staff, were negative. Five cases of manic-depressive insanity in the condition of depression were all negative. One case of manic-depressive insanity, chronic, but at that time passing through a mild maniacal attack, gave a slight positive. Two cases of long standing manic-depressive insanity in a condition of remission: one gave a negative and the other a very faint positive. Two cases of encephalitis lethargica, two cases of dementia præcox, and one of delusional insanity, all were negative.

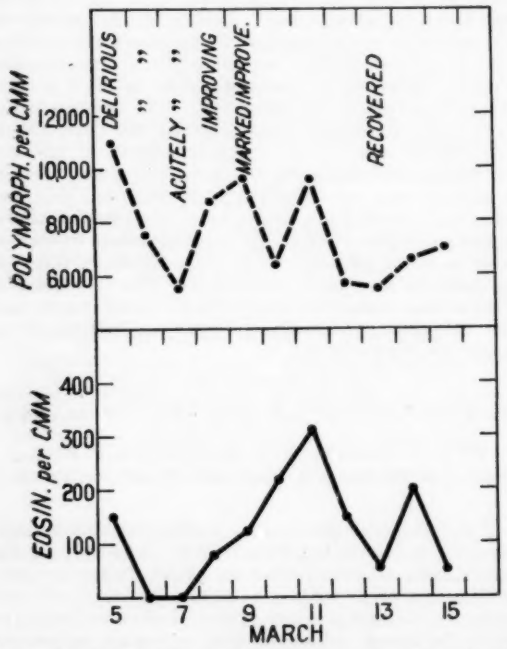

Chart showing variations in the polymorph and eosinophil leucocyte count in relation to the patient's clinical condition.

The accompanying chart shows a fall of the polymorphonuclear leucocytes at the period of acute delirium, and a rise on recovery. The eosinophil leucocytes, it will be noted, disappeared altogether from the blood count during the period of acute delirium, reappeared again as improvement commenced, and increased as recovery became complete.

AN UNUSUAL COMBINATION OF LEFT-HANDEDNESS AND STAMMER.

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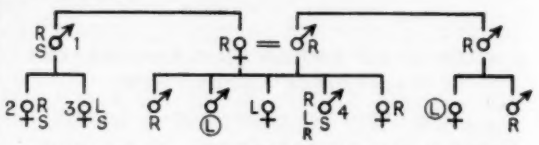
THE following family history seems worth recording because, while it exemplifies the well-known relation between left-handedness and stammer, it also contains features which are decidedly unusual.

Four living members of the family stammer: No. 1 (see Chart) states that he has stammered since he began to speak; he has been right-handed all his life and remembers no left-handed tendencies. Nos. 2 and 3 are his only children (both daughters); of these No. 2 resembles her father in each particular, and No. 3 has always stammered but has been left-handed since infancy.



R = right-handed; L = left-handed; L in circle = left-handed tendencies; S = stammer.

A sister of No. 1 (deceased) was normal in speech and was right-handed, as is her husband. A niece of the latter states that she has an inclination to use the left hand, which she overcomes voluntarily; she also draws from right to left. Of the five children of the normal pair referred to the first and fifth are normal in all respects. The second has slight left-handed tendencies. The third is left-handed and normal in speech. In the fourth (No. 4) the sequence of events was peculiar and raises points of considerable interest.

The family circumstances were such that No. 4 during his first seven years was looked after almost entirely by his sister, although she was only a few years older than he. She was firmly convinced that her own left-handedness was normal, and admits that she regarded her young brother's right-handedness as reprehensible. Accordingly under her influence the function of writing was firmly established in the left hand by the time when he went to school, at the age of seven. There his mancinism met with uncompromising opposition on the part of the school authorities, and within a short time he had acquired the habit of writing with his right hand during school hours. During the same period he continued to use the left hand when at home, and at the end of a year of this régime he had developed a severe stammer. It appears that he submitted without resistance to the change from right to left, but strongly resented the return to right-handedness. Now, at the age of 17, he writes with his right hand, but uses his left hand for other purposes. The stammer has persisted.

The causal relationship between thwarted left-handedness and stammer has been well recognised since the appearance of W. S. Inman's paper.[1] The question as to whether stammer may also be occasioned by diversion from the right to the left hand has not been established so conclusively, since the opportunity of observing this sequence rarely occurs. Inman referred to one case in which stammer originated in this way, and to Hugh Gordon's series of epileptic children at Lingfield Colony schools.

[1] THE LANCET, 1924, ii., 211.

N. Hobhouse [2] has mentioned a case in which a boy of 11 became left-handed as the result of right hemichorea, and developed a stammer.

In the history of No. 4, the two varieties of transition are exhibited consecutively, in a right-handed member of a family with strong left-handed tendencies. The question as to why the first was *not*, and the second *was* followed by stammer is a difficult one, and suggests various possibilities. It might be submitted that the change to left-handedness was facilitated by its coincidence with a latent hereditary tendency, or that the development of the stammer was conditioned to some extent by the emotional resistance which he experienced towards the return to right-handedness. On the other hand the sequence might perhaps be explained by the relative plasticity of the physiological centres at the time when the first transition was achieved.

[2] Ibid., 1928, i., 1116.

MEDICAL SOCIETIES

NORTH OF ENGLAND OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY.

THE last meeting of this society was held at Liverpool when cases and specimens were shown.

Prof. LEITH MURRAY showed a specimen of *Endometrioma of the Anterior Vaginal Wall.*

The patient was 43 years of age and had had one confinement followed by "septic poisoning," since when contraceptive measures had been adopted. Her only complaint was of excruciating spasmodic pain lasting all through the periods. On examination a flat plaque was found on the anterior vaginal wall occupying more than half its surface and stretching up to the cervix. This area was covered with retention cysts filled with blood. Cystoscopy revealed an inward bulge but no involvement of the mucosa. Removal was accomplished partly with scissors and partly by blunt dissection and unfortunately the bladder was opened. Though the opening was closed a fistula developed. There has been no recurrence of the growth and there has been a complete cessation of the dysmenorrhœa. Section showed the tissue to be a typical endometrioma.

Section through one of the linear pits on the surface, said Prof Murray, showed that the squamous epithelium disappeared at the edge. He considered this a possible implantation area.

Mr. N. L. EDWARDS (Derby) showed an *Endometrioma in an Abdominal Scar* following Cæsarean section.

The patient, aged 33, had had a Cæsarean section in 1923. In November, 1929, Mr. Edwards again delivered her by the same route through a left paramedian incision. A section of each tube was resected, the stumps were buried, and the right ovary, which was cystic, was removed. The scar discharged serum from the eleventh to the thirteenth day. Recovery was afebrile. Seen ten months later the patient said that she had noticed a blackish discharge from the upper end of the scar and that during the last seven periods there had been no pain. A small purplish nodule was found at the point of the discharge with the uterus adherent to the anterior abdominal wall behind it. This condition was confirmed when the nodule was excised two months later. At the same time the abdomen was opened and the uterus was removed by subtotal hysterectomy along with the remaining ovary which was now cystic and adherent.

The nodule showed endometrial tissue but no connexion could be found between the endometrium of the nodule and the uterus. Mr. Edwards thought that of the two probable theories of origin—implantation during operation and metaplasia of peritoneal endothelium—the second was the more likely in this case.

Prof. MURRAY described a *Dermoid Cyst of the Left Ovary* weighing over 29 lb., containing fatty balls and pellets.

The patient was a virgo intacta, aged 52, who had passed the menopause five years previously. She had been aware of the tumour for 15 years and at the time of operation the abdomen measured 73 inches at the level of the umbilicus. A 3-inch incision was made in the abdomen and adhesions to the anterior abdominal wall were swept away with the hand. Attempts at tapping having failed the cyst was incised and 5½ pints of greenish fluid containing several thousand fatty pellets was evacuated. These varied in size from a split pea to an almond, but seven were found almost completely rounded and much larger. The rest of the contents, consisting of a fatty pultaceous material, was expressed through the incision, the whole cyst being finally removed. The inner and outer surfaces of the cyst wall were smooth and the only suggestion of a germinal node was a linear thickening about 5 inches long. Examination showed this to be a channel lined by several layers of transitional epithelium with some suggestion of goblet cells. There was also a narrow layer of involuntary muscle-fibre. The sebaceous glands discovered were mainly situated round this area, as was also a hair follicle. Radiographic examination was negative. Some fine hairs were found in the fluid and in some of the balls examined. An examination of the fatty material showed a large proportion of free fatty acid and non-saponifiable matter which explained the fact that the fat was solid at body temperature.

Dermoids of this type, said Prof. Murray, were extremely rare and he thought that by its size this specimen was probably unique.

Miss RUTH NICHOLSON showed an *Unusual Tumour obstructing Labour.*

This was removed seven months after the patient had been delivered by Cæsarean section. Previous to this she had had four normal labours. On this occasion she was seen after she had been in labour for 28 hours with good pains. The head was still high and a mass was felt in the pelvis to the right obstructing delivery. A lower segment Cæsarean section was performed by Mrs. Dobbin Crawford during which the tumour was seen to be separate from the uterus, lying on the right side of the pelvis and retroperitoneal about the size of a kidney. The child's head showed marked moulding and a large caput. At the second operation the tumour was found to lie between the layers of the right broad ligament and shelled out easily. It had no connexion with the uterus. It now measured 3 by 2 by 1½ inches and microscopically proved to be a fibromyoma with a preponderance of muscle elements.

Mr. ST. GEORGE WILSON described a case of *Chancre of the Cervix.*

The patient, aged 48, a multipara, complained of smarting and irritation of the vulva with a copious, and occasionally blood-stained, offensive discharge of two months' duration. The cervix was enlarged and soft and bled on palpation. A diagnosis of carcinoma of the cervix was made and a piece of the growth removed for examination, after which radium was applied. Section showed lymphocytic infiltration and the Wassermann reaction was then found to be strongly positive.

Mr. Wilson said that the idea that chancres in this position were rare, which he had previously held in common with the older writers, had been proved erroneous by Anwyl Davies, of St. Thomas's Hospital venereal diseases clinic. He had shown that the cervix was the commonest site.

Dr. P. MALPAS gave a demonstration of the efficacy of gauze packing in the *Maintenance of Radium Containers in situ.* He showed a series of radiograms taken in each case, 4 and 22 hours after insertion of the radium. They showed no alteration of position. The variety in the distribution of the containers in different cases according to the shape and extent of the growth was illustrated, and Dr. Malpas suggested that a large number of different appliances would be required to meet every case.

REVIEWS AND NOTICES OF BOOKS

Chemical Embryology.

By JOSEPH NEEDHAM, M.A., Ph.D., University Demonstrator in Biochemistry, and Fellow of Gonville and Caius College, Cambridge. London: Cambridge University Press. Three volumes. 1931. Pp. 2021. £5 5s.

THERE are over 2000 pages in these three volumes, and a rough idea of the scope may be gathered from the fact that the bibliography begins on p. 1727 and ends on p. 1968. An erudite work of exceptional merit, it is presented in classical style; a portrait of Harvey appears on the page facing the title page, and there follow a Latin dedication and two quotations, one from William Harvey's "Anatomical Exercitations," and the other from one of the works of Joseph Glanville. After the prolegomena the author opens with Part I., entitled The Theory of Chemical Embryology. This is composed of some 30 odd pages dealing with the general philosophic consideration of generation and embryology. Dr. Needham develops his theme in a skilful manner, reviewing briefly the views of the older philosophers who meditated on these problems. His survey concludes with a significant quotation from S. T. Coleridge: "The history of a man for the nine months preceding his birth would probably be far more interesting and contain events of far greater moment than all the three score and ten years which follow it." This doctrine may have inspired Dr. Needham in sacrificing so much intense labour to the production of his great work.

Throughout the first section the author indicates that he is not satisfied with the purely histological and morphological methods of approach, and this attitude is progressively shown in Part II., which is entitled The Origins of Chemical Embryology. From the general reader's point of view this section of the book is undoubtedly one of the most interesting. The description of early Egyptian incubators for hens' eggs reveals many curious methods for maintaining a constant temperature. Dr. Needham takes us through various periods in the world's history, gives references to the Hellenic outlook on embryological problems, traces embryology through the Roman period to Galen, and, not content with the more classical sources of information, he proceeds to a careful review of the Arabian and Jewish literature of very early times. The references to the work of Leonardo de Vinci are illuminating. The facsimile of a page of one of the famous "notebooks" dealing with embryology is curious; the accuracy of Leonardo's observations on this problem is remarkable. As Dr. Needham says "here Leonardo touches on one of the most modern quantitative aspects of embryology, and one almost expects him to exemplify his words with a graph until one remembers with a shock that he lived two centuries before Descartes and five before Minot." The section concludes with an admirable summary of the development of embryological science from the seventeenth century to the present day. Dr. Needham's admiration for Harvey has betrayed him into devoting so much space to extracts from his works that his references to other observers have been disproportionately curtailed. The exposition in greater detail of the views on embryology of Sir Thomas Browne and of Descartes, for instance, would have been welcome.

With Part III. the actual chemical work begins. This and the subsequent matter provide a complete and scholarly account of the biochemistry and physiology of developing eggs. The author has a sharp critical faculty and thus the book is no mere catalogue of facts, but a readable and helpful guide by a leader who knows the way. It may be recalled that it was in connexion with inosite that Dr. Needham's name first became known in the biochemical world; it is thus interesting to read a statement from him on the metabolism of this substance and its derivatives. In the section on carbohydrate metabolism the bibliography is of special value and Dr. Needham deals fully with the application of the modern methods, such as those of Otto Warburg, in the study of this problem. We would have welcomed a fuller description of the author's views on the part played by hormones in the developing embryo. The summary given indicates the great importance of this subject, but in certain places he has been too kind to some of the authors to whose work he refers. In subsequent editions this section will doubtless be extended, a remark which applies also to the section on pigments in the course of development.

This is a great work and should be bought by every institution which can afford to buy it, since it is only by this practical form of encouragement that such a book can be kept alive in new editions. The value of the production from every point of view is so high that it should find a place in every biochemical or physiological library.

Die Hormone des Ovariums

und d. Hypophysenvorderlappens. By Dr. BERNHARD ZONDEK, A.O. Professor in the University of Berlin. Berlin: Julius Springer. 1931. Pp. 343. R.M.40.

WITHIN the last ten or twelve years the anterior lobe of the pituitary has assumed a more definite and forceful rôle in human biology than before. This part had been known for a considerable time as having marked influence on growth, and certainly had been used by clinicians in tentative and empirical ways, but in 1923 definite experimental evidence of a "growth-producing hormone" derived from the anterior lobe was brought forward by H. M. Evans. Aschheim and Zondek, some five years ago, widened the field of action by demonstrating the production by the hypophysis of hormones which did not act appreciably by themselves, but through their effect on other hormone-producing organs. In these researches on the biology and clinical conditions of the female genital functions, Prof. B. Zondek brings together the principal investigations on the subject, including some unpublished work. He has been studying these hormonal actions since 1913, and this contribution to the literature is authoritative. The intricate subject is handled in a simple way. There are no sterile protocols or calculations to exhaust the attention; the results attained are shown shortly and their import explained.

The author opens with discussion of the methods of investigation, and gives details of operative and experimental processes, including the examination of changes in vaginal smears. He passes step by step through the maze of effects of ovarian hormone, as seen in castrated and infantile animals, to the greater intricacies of the action of the hypophysial secretions. The quantitative nature of these seems evident. The absence of pituitary action in castrated animals is clearly shown, though these animals are,

of course, acted upon by the ovarian substances; this fact is sometimes lost sight of when the actions of these hormones are considered clinically. The growth-producing hormone of Evans is often looked on as associated with, if not similar to the prolans secreted by the anterior pituitary. Prof. Zondek concludes that they are not only distinct but have even some sort of small antagonism in their times of action. His statement that the pituitary hormones of man and beasts are not identical with the corresponding secretions of birds and cold-blooded animals has great biological interest in its indirect bearing on many contradictory experiments on lower forms. The well-known Aschheim-Zondek test for pregnancy is dealt with fully, and some unpublished results are brought forward. The clinical applications and indications of the subjects are discussed, and their association with various cysts and growths of the genital tract are described.

This book should be studied alike by clinicians, pathologists, and physiologists.

The Mind in Action.

By A. CAMPBELL GARNETT, M.A., Litt.D., Professor of Philosophy in Butler University, Indianapolis, U.S.A. Contemporary Library of Philosophy. London: Cambridge University Press. 1931. Pp. 226. 5*s*.

Dr. Garnett deals with his subject from the point of view of motive and value, and admittedly derives his psychological standpoint from James Ward and William MacDougall. He is particularly indebted to MacDougall for the latter's Theory of Instinct and Emotion which, however, he does not adopt uncritically or entirely. As regards intelligence in its relation to motive, he is substantially with Prof. Spearman in his acceptance of the general factor. The main burden of the book is to establish the relationship of fundamental motives with sentiments and the growth of the moral self, and the author's view of beauty and truth is that they are the results of a type of harmony which the fundamental processes of mind impose. This is an attractively written book with a bent towards the introspective rather than the experimental method in psychology.

Accidental Injuries.

By HENRY H. KESSLER, A.B., M.D., F.A.C.S., F.A.P.H.A., Medical Director, New Jersey Rehabilitation Clinic. London: Henry Kimpton. 1931. Pp. 71 45*s*.

UNFORTUNATELY medical evidence in a court of law has not always the quality of detachment, but is partisan in nature. This regrettable fact is due amongst other causes to the absence of standards by which the medical witness may assess any given disability, and to ignorance of the prognosis of injuries and diseases. Where such defects of knowledge exist, bias can hardly be avoided. Much useful information to guide the practitioner who is called upon to give evidence in a court of law is provided in Dr. Kessler's book, which will also help him in his examination of the patient. The material collected within its covers is gleaned partly from the study of upwards of 63,000 cases coming before the New Jersey Compensation Bureau, and partly from a comprehensive search of the literature dealing with this aspect of disease. The early chapters treat of the general pathology of injuries, the bad results which may follow them, and the principles on which disabilities can be assessed. Separate chapters are then devoted to the different regions of the body. Traumatic neuroses and occupational diseases have sections to themselves, the latter including industrial poisoning. The last chapter supplies a most interesting account of the rehabilitation of the physically handicapped.

This book will help all who may be called upon to give evidence in connexion with injuries.

Lehrbuch der Röntgenstereoskopie.

By Dr. MAX COHN, Medical Director of the X Ray Department of the Friedrichshain Hospital, Berlin; and Dr. WALTHER BARTH, Physicist to the Agfa Company. Leipzig: Georg. Thieme. 1931. Fully illustrated. Pp. 324. M.30; M.35 bound.

IN 1867 Helmholz published the work which laid the foundation of physiological optics, and so it is not surprising that the majority of the 300 authors mentioned in the bibliography attached to this textbook of X ray stereoscopy are German. The theoretical and practical sides of X ray stereoscopy are fully dealt with, and an accompanying atlas of 26 reproductions of X ray photographs is excellent.

The authors deal seriatim with the difficulties that arise in the application of stereoscopy to X ray work and lead their readers step by step through the increasingly difficult geometrical conception involved. Deploring the scarcity of works on the technique of stereoscopy, the earlier workers having confined their attention to the morbid conditions, they find that the introduction of the mechanical tube and cassette movement has opened up new fields. Their astonishment is frank that there should remain prominent medical men antagonistic to the use of the stereoscope; an astronomer, skilled in the use of the stereo-micrometer for the measurement of the mountains in the moon, might similarly find it hard to believe that there should exist people so unprogressive as to contemplate that orb as it appears to the naked eye, but time has to elapse before new scientific methods become of general use, and they may be reminded that the general adoption of the ophthalmoscope did not occur until 30 years after its description by Babbage.

The introduction by Dr. Max Cohn deals with the value of the stereoscope as a means of research, instruction, and clinical diagnosis, and the same author is responsible for the atlas which is issued with a collapsible stereoscope of suitable size. The remainder of the work is divided into two parts. Part I. by Dr. Barth and Part II. by Dr. Cohn. Part I. contains five chapters on theory grouped under headings such as Subjective and Objective Stereoscopy, and Radiostereometry. In Part II. the author deals firstly with the historical and technical development of stereoscopic photography, and then with the application of these methods in diagnosis, and the relative and absolute indications in surgery and internal medicine for their employment. He deals with the localisation of foreign bodies and follows with a description of corporeal representation of the skin in the X ray picture. A section deals with the extremities, another with the skull including fractures, cerebral tumours, foreign bodies, with paragraphs on the ear, the jaws, and the orbit, and a third with the pelvis and vertebral column, the thorax, the abdominal organs and obstetrics generally. The text is illustrated by two plates, 193 diagrams, and reproductions of photography and skiagraphs. Plate I. gives a stereoscopic diagram and a stereoscopic X ray photograph with movable images and indications of the correct, and four possible incorrect, positions of the image, so that the reader may observe

for himself the results of error. Plate II. illustrates the localisation of a foreign body. A table of data, determined by experiment, gives the limits of accuracy of accommodation and convergence over various distances.

The book is easy to follow, for the authors have spared no pains to illustrate their points in logical sequence, in order, as they say, to convince the sceptic. It is doubtful, however, whether X ray stereoscopy can be generally adopted, even with this work at the disposal of the radiologist.

Of the value of the technique in the hands of such experts as the authors there can be no doubt. It is the unlucky fact that at the present moment the book costs in English money 48*s*. 6*d*.

A Text-book of Physical Education.

By JESSE FEIRING WILLIAMS, M.D., Professor of Physical Education, Teachers' College, Columbia University; and WHITELAW REID MORRISON, M.D., Professor of Hygiene and Physical Education and Director of the Men's Gymnasium, Oberlin College. London: W. B. Saunders Co., Ltd. 1931. Pp. 343. 12*s*. 6*d*.

THE authors of this book in their preface lament the fact that the facilities for physically educating boys and girls are far removed from the comprehensive measures embodied in technical and academic education. Such a plaint from American professors of physical education sounds strange to us, in view of the contrast between the elaborate systems known to exist on the other side of the Atlantic with the casual haphazard procedure with which we are familiar in this country. It is of course arguable that undue emphasis is placed upon the need for study of what is only a subordinate feature in school and university life; and it must be a matter of opinion to what extent it is desirable to attempt an intellectual campaign on this subject among the students themselves, as the authors hold to be desirable. In this country we think rather in terms of the therapeutic and corrective, and regard these as the province of the medical profession. In numerous quarters the part played by recreation and competitive athletics in our schools and colleges is already considered to be rather too great, and a policy which insists upon exercise as a systematic part of the curriculum would meet with severe criticism. On the other hand, a higher degree of physical, mental, and social fitness might arise if young people were made to take an intelligent interest in the physical activities that play so large a part in their lives, and it is at least a plausible argument that attention should be paid in the selection of the most suitable form of exercise having regard to the future career of the student—whether a sedentary, professional, or commercial life or a physically active career is in prospect. To all those with views on this subject this readable book should make an appeal.

After a historical introduction the authors proceed to enunciate anatomical and physiological principles in some detail, yet in language intelligible to the layman. These sections are followed by a discussion on strenuous exercise, with advice on training along common-sense lines. A chapter on injuries and minor ailments is unexceptionable though the enthusiastic insistence upon the possibility of overcoming certain physical defects by set exercises is perhaps too optimistic. An address on Longevity by Sir Farquhar Buzzard is quoted in approval of the rôle of "the understanding spectator" unable himself to participate in violent muscular exertion, and a chapter on "How to Read the Sport Page" is appended to educate the ignorant and inexperienced in the essentials, the technical details, and some of the jargon of the sporting journalist.

This book can be recommended as an authoritative and comprehensive manual on the subject. It is illustrated with action photographs which admirably fulfil the function proper to such illustrations.

Infant Feeding in General Practice.

By J. C. V. BRAITHWAITE, M.D., M.R.C.P., Physician in charge of Children Out-patients, Leicester Royal Infirmary and Children's Hospital. Bristol: John Wright and Sons, Ltd. Pp. 140. 4*s*. 6*d*.

THIS book is written by a general practitioner who is brought into close contact with problems of the home and of the management of parents. The chapter on the routine of breast-feeding and its difficulties contains much valuable practical advice. For artificial feeding Dr. Braithwaite recommends simple dilutions with added carbohydrate as the method of choice, and gives a clear account of the indications for varying this method. The latter part of the book deals with nutritional disorders of infancy, and contains an intelligible summary of the essentials of the theories of Czerny and Finkelstein. This book is thoroughly sound and should be of distinct value to the author's fellow practitioners.

Quatre cents consultations médicales.

Pour les maladies des enfants. Ninth edition. By Dr. JULES COMBY, Médecin Honoraire de l'Hôpital des Enfants-Malades. Paris: Masson et Cie. Pp. 551. Fr.36.

THE ninth edition of this book is larger than its predecessors and covers the whole range of children's diseases, medical and surgical. It is arranged alphabetically, a brief synopsis being given of the clinical features of the condition referred to, with the lines of treatment recommended. Prescriptions are set out in detail. As a book of reference for treatment, particularly of emergencies, this book should continue to fulfil a useful function.

Analyses médicales pratiques.

By RENÉ CLOGNE, Ex-Chef de Laboratoire à la Faculté de Médecine de Paris; Docteur en Pharmacie de L'Université de Paris, Lauréat de l'Académie de Médecine. Paris: Librairie Le François. Pp. 472. Fr.32.

THIS book was written for the purpose of providing a simple account of the methods of performing chemical analyses in the laboratory. A detailed description is given of each test and also a list of the necessary materials and of the figures normally obtained. Mostly the methods described are not those used in England or America and in some respects the book is old-fashioned. The author has included in this third edition two new chapters one on bacteriology and the other on parasitology, where the more common types of bacteria are discussed and the media in which they may most easily be discerned. In other respects the book does not differ materially from its former editions.

Erratum.—In the article on the Significance and Value of Examinations of Milk by Dr. Thomas Orr which has recently been reprinted from THE LANCET and published in Vol. II. of the collected articles on Clinical Interpretation of Aids to Diagnosis, the minimum figure for non-fatty solids in milk allowed by the Sale of Milk Regulations, 1901, should be 8·5 and not 8·7 (pp. 127 and 129).

THE LANCET.

LONDON: SATURDAY, JANUARY 9, 1932.

WOMEN AND NATIONAL HEALTH INSURANCE.

THE third quinquennial valuation of approved societies made by the Government Actuary, Sir ALFRED WATSON, under the terms of the National Health Insurance Act, 1924, which was summarised in THE LANCET of Dec. 26th, reveals a disquieting state of affairs and raises problems of great medical importance. Since the second valuation in 1923, a satisfactory aggregate surplus has accumulated, but the solvency of certain sections of the scheme (a matter which touches the interest of every citizen) is gravely jeopardised by certain factors which have assumed unexpected importance. The survey covered 7600 approved societies and branches and an insured population of 16,380,143, of whom 5,427,121 were women. Of these societies 7001 showed surpluses, the average surplus per member being £2·41. In 189 societies, with a membership of 435,869, the assets and liabilities were equal. In 418 societies and branches the deficit was £847,667, or an average of £1·17 per member.

This not unfavourable general picture is marred by the unsatisfactory state of the women's societies. It was pointed out at the second valuation that the women were making much heavier demands on the sickness and disablement funds than the men members, and as a consequence of this warning separation has taken place to such an extent that 72 per cent. of the insured population are now enrolled in societies restricted to one sex only. It is now shown that in units insuring men only the average surplus is £2·76 per head, whereas in the women's societies the corresponding figure is £1·11, the "total retrogression" of the funds of such societies since the last valuation amounting to £640,000. Further, the men's societies have been able to give valuable additional benefits to 88 per cent. of the male insured population, and the women's societies to only 38 per cent. of women. Even this proportion cannot be maintained in the future. The reason for the discrepancy is simply explained, by the fact that the sickness and disablement claims of women are everywhere in excess of those made by men, and in the case of married women (who constitute 21 per cent. of the whole), grossly in excess. Between 1923 and 1927 there was a general rise in sickness claims, doubtless explained mainly by the economic situation; the men's claims rose by about 13 per cent., but the single women's claims increased by 29 per cent., and the married women's by 42 per cent. In the case of disablement benefit the respective increases were 54 per cent. and 87 per cent. respectively. The position is growing more serious as the proportion of women is relatively increasing; the costly married woman worker tends to stay longer in insurance. The insured population shows a gain of 10·3 per cent. of men, 10·9 per cent. of single women, and 23·8 per cent. of married women since the last valuation. In estimating future claims the Government Actuary has been compelled to allow for 25 per cent. more weeks of sickness benefit and 65 per cent. more weeks' disablement benefit for single women than for men, and for the married women 140 per cent. more sickness benefit and 60 per cent. more disablement benefit than for men. Taking both benefits together the cost provided is 60 per cent. more for all women than it would have been if the male rate of sickness and disablement had been applicable.

The report does not deal with the medical aspects of the situation, and evidently regards the great excess of liabilities incurred by the female worker as a permanent and possibly increasing factor in the situation. There is, however, a strong case for further investigation before this attitude is accepted by the medical profession with complacency. That a certain balance will pile up against the woman worker is apparently inevitable. It is well established that all investigations show a higher sickness-rate for women than for men in industry. Even among the professional classes the data, though scanty, point in the same direction. In a valuable study of "The Sickness Data of Elementary School Teachers in London, 1914–1919," by Mr. J. Y. HART, B.Sc.,[1] it was found that "sex was the most important factor in the illness of teachers. The mean illness of men teachers was 4·6 days a year for the period 1914–19, and the corresponding figures for single women and married women are 8·2 and 9·3 respectively." A further study of the causes and incidence of permanent disablement in teachers[2] showed that one woman teacher in 194 retired disabled, and one male teacher in 525; in other words, that a woman teacher is more than twice as likely to retire on health grounds as a man, but the risk is not in either case serious. Even with these known results of investigation before us the findings of the National Insurance Report are startling and disappointing. Modern education and training in hygiene had, it was commonly supposed, wrought an immense improvement in the health of this generation of young women. The reports of the elementary school medical service show a steady record of improvement, and the athletic triumphs of women in every field they have entered suggest a rising rather than a falling standard of physical efficiency. Nor does ordinary clinic experience suggest that the young woman of to-day in any class is a physical weakling. Within recent years certain diseases such as chlorosis and dysmenorrhœa have practically disappeared as a cause of periodic disability in

[1] Journal of the Royal Statistical Society, 1922.
[2] London County Council School Medical Officer's Annual Report, 1929, p. 86.

training colleges, nurses' homes, and factories. It is indeed incredible that preventive medicine has done nothing, or can do nothing more to close the gap which still yawns between the physical efficiency (measured in terms of sickness-rate) of men and of women in industry. Even in an age when commissions and committees of inquiry have been overdone, it might be sound economy to inquire more deeply into the precise nature of the excess of sickness in women, and whether it is in fact being prevented by the welfare work and improved hygienic conditions which obtain to-day in certain factories and offices. The experience of the Ministry of Munitions and the women's services during the war certainly suggested that the health of women workers was susceptible to improvement under good conditions.

Leaving aside the possibilities of reform in the future, the situation to be faced by the approved societies is undoubtedly grave, and Sir ALFRED WATSON strongly urges the application of two remedies. He suggests that the separation between male and female insured persons should be "still further developed" in order to "correct the injustice to male members." He further demands that the contributions of women members be increased or that their benefits be reduced to bring the finances of their societies on to a sound basis. The necessity for some such measure is obvious, but as has recently been pointed out [3] it is by no means clear why the single women should have to bear the entire burden of the married women's excess claims. If the young married woman worker constitutes a serious drain on the funds of her society, it is no doubt partly because of sickness and minor disabilities associated with pregnancy, which are singularly difficult to check. There are many days or even weeks in the course of a perfectly normal pregnancy when a woman is genuinely unfit to turn out in the early morning or to keep on her feet all day, although she is quite able to get through ordinary household duties in her own time; no system of medical certification can protect funds effectively against these extra claims. Moreover, the married woman is apt to have a double burden of household duties in addition to her industrial work, which may prove a serious physical strain on the less robust women. Most difficult to assess, but possibly most important of all, is the undeniable fact that for obvious reasons it is more often to the interest of the married woman to stay at home than it is for the man or the single woman. The "psychological moment," in the proper sense of that much-abused term, tends to push the insured married woman into invalidity. That this is not due to a peculiarly feminine failing but to a universal human weakness is frankly recognised by the *National Insurance Gazette*, which points out: "No health or unemployment insurance scheme can do any good with members or policy-holders who prefer to be claimants. It is an elementary principle in insurance. No fire insurance company would knowingly issue a policy to a person who preferred to have a fire." In equity it would thus appear that if the married woman worker is to be grouped with any other class it should be with the married men. For such part of the excess claims as is due to pregnancy they are surely responsible rather than the single women, and where the excess is caused by excessive devotion to home interests presumably they and not the single women reap the benefit. Administratively it may be more convenient to group all the women together, but it is bad administration to penalise a class unfairly for the convenience of administrators.

The report leaves the strong impression that there is much to be said for the suggestion, often advanced by insurance experts, that married women should be taken out of the insurance scheme altogether, and should constitute a special group of "exempted persons." Their health is of especial concern to the nation and should be adequately provided for, but not by a scheme which encourages wasteful claims, and threatens other classes of workers with unjust curtailment of benefits or financial ruin. It has been necessary to reconsider seriously the position of married women under the Unemployment Insurance scheme, and the time has come when in the interests of the nation it appears equally necessary to readjust their position in regard to National Health Insurance.

[3] National Insurance Gazette, Dec. 26th, 1931, p. 619.

THE FUNCTIONS OF THE INTERVERTEBRAL DISCS.

IN this country the work of Prof. GEORG SCHMORL, of Dresden, on the pathology of the spine has not received the recognition it deserves, though in France, mainly through the efforts of J. CALVÉ and M. GALLAND, the importance of his observations has been widely appreciated.[1] Since 1925 Prof. SCHMORL has collected some 7000 whole spines, and the conclusions he has reached from the detailed study of this material as a whole and of the vagaries of the intervertebral discs in particular are extremely instructive. Dr. O. A. BEADLE, while holding the Radcliffe Travelling Fellowship for 1929–31, has been working with Prof. SCHMORL, and has just published, under the auspices of the Medical Research Council, a report on the intervertebral discs embodying observations on their normal and morbid anatomy in relation to certain spinal deformities.[2] Dr. BEADLE points out in his introduction that though the results of the anatomical researches carried out in the pathological department of the Friedrichstädter Krankenhaus at Dresden have been published in a scattered way in various German journals, no connected account has appeared in any language of the interpretation placed on these results by those actually working in the department. This report is a first-hand description of specimens actually seen and handled by the author, and is not a mere summary of SCHMORL'S publications. It has

[1] See THE LANCET, 1931, ii., 697.
[2] Medical Research Council Special Report Series No. 161. H.M. Stationery Office. Pp. 79. 2s.

peculiar value in this country and in others where the specimens would not have been obtainable in large numbers, because the spine may not be removed from bodies at autopsy.

The intervertebral disc is regarded by SCHMORL as consisting of three parts, the nucleus pulposus, the annulus lamellosus, and the cartilage plate. The annulus lamellosus is arranged in a series of strong fibrous rings arising from the matrix of the cartilage plate and inserted in various points around the rim of the vertebræ, and is attached with particular strength to the anterior longitudinal ligament. It serves to resist tension and torsion, and acts as a capsule to the nucleus pulposus. This nucleus is a gelatinous mass, being a remnant of the notochord, and is under great pressure. Its function is to distribute weight, to act as a shock absorber, and to be a pivot around which all the movements of one vertebra on another takes place. The cartilage plate covers the perforated area of the articular surface of the vertebral bodies, and its function is to resist pressure and protect the spongy bone. Taken as a whole the intervertebral disc is like a powerful spring cushion, where the tension of the spring depends upon the existence of the outer cover; if this happens to give way the tension within is reduced. As might be expected, therefore, the resistance of the cartilage plate, when healthy, to all kinds of injurious influences, both infective and traumatic, is very great. When discussing the histology of these cartilage plates Dr. BEADLE points out, however, that in more than half the cases examined fissures can be seen running right through the substance of the plate into the bone; the conclusion drawn is that though normally very resistant, these plates are particularly prone to degenerative changes, accentuated no doubt by repeated minor injuries during the course of a normal active life.

The practical importance of these fissures is that they allow the substance of the nucleus pulposus gradually to prolapse through into the spongy bone. This observation was first made by SCHMORL in 1927, and the condition is found in about 38 per cent. of the spines examined. The age-incidence of these nuclear prolapses is interesting. Between the ages of 18 and 59 they are manifest in 40 per cent. of male and 20 per cent. of female subjects. In subjects over 60 this percentage is almost reversed, being 23 per cent. for male and 44 per cent. for female subjects. The interpretation placed on this curious change in incidence is that after the retiring age for men women continue their arduous household duties, and inflict a series of mild traumata on their degenerating cartilage plates which tends to produce in them, at a later age, the condition which is commoner in men before the age of 60. In young people reactive changes occur producing an area of sclerosed bone around the prolapse which offers a resistance to its further progress. But in the aged, where bone-forming processes are less active, inflammatory changes occur and the granulation tissue destroys the prolapsed nucleus, and even extends into the disc itself. In this way the disc gradually becomes converted into non-resilient fibrous tissue; when this takes place all shocks are transmitted from bone to bone, and osteophytic lipping occurs.

These observations on nuclear prolapse are of particular interest in connexion with adolescent kyphosis, a condition which in this country is usually regarded as being due to vertebral epiphysitis. According to Dr. BEADLE, when growth is still active, unless pressure changes are evenly distributed over the whole surface of a vertebra, the constant assumption of an attitude such as bending over books, or some manual occupation, tends to lead to alteration in the shape of the bone according to the well-known laws of bone growth. This alteration does not happen in the spine of a healthy child, because the intervertebral disc is so flexible as to enable it to distribute pressure over the whole surface in a perfectly uniform way, in whatever position the vertebræ may lie. The nucleus pulposus also has a distributing function of this kind, but if this nucleus has prolapsed into the bone it cannot fulfil this function. Consequently greater weight is borne anteriorly than posteriorly, with the result that eventually the vertebræ becomes wedged-shaped. In such cases the primary cause of the prolapse may be a congenital one, but Dr. BEADLE quotes the opinion of SCHEUERMANN [2] that the beginning of a kyphosis may sometimes be traced back to a bout of hard work, and suggests that in some cases there may be an abnormal vulnerability of the cartilage plate rendering it liable to become fissured by repeated slight traumata, and so to allow the nucleus pulposus to prolapse. The presence of a prolapse does not of itself produce kyphosis, but the combination of prolapse with the constant assumption of one attitude, either during work or play, at a time when the vertebræ are actively growing, may, it is held, give rise to the clinical picture of adolescent kyphosis. If this sequence is accepted, it follows that for certain children arduous sports should be prohibited, though it is not clear how those who are specially liable to early degenerative changes in the disc could be recognised. The thesis of this work is that this tendency is far more common than is generally supposed. The assumption of the erect attitude is a relatively recent event in the history of evolution, and the spine is still showing a reluctance to adapt itself to its altered position.

The beautiful plates which illustrate this monograph are certainly convincing, and it seems likely that Prof. SCHMORL has opened up a new line of investigation which may be followed with profit. The conclusion drawn from his studies of spinal deformity by Dr. BEADLE is a conviction of the paramount importance of the intervertebral discs in the preservation of the normal form of the spine during the infinite changes of shape, compressions, extensions, and torsions it undergoes in functional life. The severity of the strain they have to bear leads them to yield to senile changes long before these appear in other tissues; and where these changes have occurred, the spine becomes stiff and permanently deformed.

[2] Zeitsch. Orthop. Chir., 1920, xli.

CHRONIC LYMPHANGITIS AS THE CAUSE OF CANCER.

SOME twenty-five years ago Mr. SAMPSON HANDLEY demonstrated the importance of the lymphatic system in the spread of malignant disease, with a wealth of detail which left little room for doubt as to the general accuracy of his views. Since then he has become more and more impressed with the dominant part played by the lymphatic system in physiology and pathology, and his most recent contribution to the subject[1] is an exposition of his theory that chronic lymphangitis with its accompanying lymph-stasis is the actual cause of carcinoma.

Briefly, his theory is as follows. Chronic lymphangitis is the essential change brought about by practically all irritants, microbic, physical, and chemical. This is followed by lymph-stasis which in turn causes overgrowth of tissue and the formation of adenomata and papillomata, the precancerous hyperplasias. The starting-point of the theory is the pathology of lupus and the demonstration of the lymphangitis-papilloma-carcinoma sequence in lupus carcinoma, and it is supported by a mass of observations from other aspects of pathology. It is impossible to consider all the evidence in detail, and the reader must decide for himself how much of it will stand critical examination; but it is clear that it is not all of equal value. About some of Mr. HANDLEY'S facts there will be no disagreement, others are disputed; and at times he seems to assign the same value to a supposition as would be given to a self-evident truth. For example, he regards it as proven that gastric ulcer is the precursor of gastric carcinoma; part of his argument rests on the assumption that the pigmented mole is derived from lymphatic endothelium; and he suggests that polypi of the bowel (and vesical papillomata) are most frequently due to a mild non-ulcerative tuberculous infection in childhood, though no proof of this supposition is offered, and the known incidence of tuberculosis and cancer of the intestine is opposed to it. In Mr. HANDLEY'S view inflammatory reactions in the subcutaneous tissues seem to be dominated entirely by the lymphatics, and the changes in the tissues as a whole are purely secondary. Few people however will agree with this, nor will Mr. HANDLEY'S use of the term granulation tissue be generally approved. And while no one who has seen an acute lymphangitis associated with a septic hand will deny that infection may spread by the lymphatic vessels, is this a justification for describing organisms which give rise to such infections as lymphophilic, and for assuming that the tissue reactions called forth by syphilis and tuberculosis are essentially the same? Without going into the question of the formation of tissue lymph and its circulation—a highly complex business—it may be asked whether stagnant lymph is such a good nutrient medium as Mr. HANDLEY presumes. We know little about it beyond the fact that it must be overcharged with the products of cell metabolism, but it seems unlikely that such a fluid should possess the factors which stimulate the growth of epithelium; and in this connexion it is significant that in one form of Paget's disease of the nipple—that produced by obliteration of the cutaneous lymphatics and lymph-stasis—the secondary epithelial change is atrophic and not hypertrophic.

In his preface the author states that his book is not an armchair speculative essay and asks that the evidence he brings forward should be seriously considered. No one who knows and appreciates Mr. HANDLEY'S work—and who does not?—will lightly disregard any observations he makes on the cancer problem. If we are not convinced of the truth of his theory, we are grateful to him for an interesting and stimulating deliverance.

[1] The Genesis of Cancer. By W. Sampson Handley, M.S. Lond., F.R.C.S., Vice-President of the Royal College of Surgeons. London: Kegan Paul, Trench, Trübner and Co., Ltd. 1931. 21s.

ANNOTATIONS

NEW YEAR HONOURS.

THE list appearing on p. 104 shows that honours have been conferred this New Year on medical men and women who have won distinction in many different occupations. The first name is that of Major Walter Elliot, whose enlightened work in the House of Commons and in office is appropriately rewarded by appointment to the Privy Council. Dr. F. N. Kay Menzies, who has borne and is bearing heavy responsibilities in the organisation of London health services, becomes a Knight of the Order of the British Empire, in company with Dr. A. M. Daniel, whose privilege it is to be director of the National Gallery. First among the new knights in scientific attainment is Dr. H. H. Dale, secretary of the Royal Society and director of the National Institute of Medical Research, but in a different sphere we welcome equally the recognition of Mr. Buckston Browne's perspicacious benevolence towards the social life and future development of medicine. The name of Miss Edith Brown is less familiar in this country but her new rank as D.B.E. is as well deserved as it was little expected when she first went out to India to work in humble circumstances for Indian women. Suitable promotions to knighthood are those of Dr. John Weir, physician-in-ordinary to the Prince of Wales, in the Victorian Order, and of Sir James Kingston Fowler, who becomes K.C.M.G. The long and useful life work of Sir Leonard Rogers is fittingly marked by knighthood in the Order of the Star of India. Outside the strict limits of our profession we find with pleasure the names of Miss Harriette Chick, D.Sc., of the Lister Institute, who is appointed C.B.E.; Mr. Henry S. Wellcome, LL.D., a valuable friend of medicine, who is knighted, and Mr. E. W. Morris, of the London Hospital, and Mr. E. D. Simon, M.P., for a brief time parliamentary secretary to the Ministry of Health, who receive the same honour. Other notable names are those of Sir Malcolm Delevingne, who represents Great Britain in conferences on dangerous drugs, and

Sir Cecil Levita, late chairman of the London County Council, who become K.C.V.O.; and among new knights, Mr. Halley Stewart, founder of the trust fund called after him, and Prof. Patrick Geddes, the veteran sociologist. In the world of nursing, Annie Lady Cowdray is appointed G.B.E. in recognition of her long work and many benefactions, while lesser rank in the same Order is conferred on the superintendent of the Queen's Institute of District Nursing, Miss A. M. Peterkin, and two matrons of English mental hospitals, Miss E. E. Gardner and Miss A. J. Richardson. Sister F. M. D'Exeter, of Queen Alexandra's Royal Naval Nursing Service, receives the R.R.C., and Mrs. Katherine Cook, of Uganda, is promoted to be O.B.E. To all these and others whom we have not mentioned in this place we offer hearty congratulations.

OBESITY AND WATER BALANCE.

CLINICIANS tend to be somewhat fatalistic about obesity, to assume that the fat person will continue to wax fat even when his food intake has been reduced below the normal maintenance level. A paper by L. H. Newburgh [1] helps to explain the origin of this superstition. Deposition of fat can only take place in one of two ways—either by diminished katabolism of tissue fat, or by increased assimilation of the fat supplied by the diet. Concerning the first possibility there is no evidence that oxidation of fat is deficient in cases of obesity. Indeed, W. M. Boothby and I. Sandiford [2] have shown that the basal caloric output, per square metre of body surface, is normal in obese patients. If the caloric expenditure is normal, it follows from elementary physical laws that restriction of the caloric intake below minimal requirements must cause a loss of flesh. A loss of flesh, however, does not necessarily imply a loss of weight, and much of the prevailing confusion of ideas is due to failure to realise the importance of water balance in relation to changes in body-weight. The clinical determination of water balance is one of the most difficult problems in experimental medicine. Mere comparison of fluid intake with urine output is valueless, except in cases of gross œdema. Most solid foods contain a high proportion of water and the body also gains water from the combustion of the hydrogen of the assimilated foods. On the other hand water is lost, not only through the kidneys, but also in a large measure through the skin and lungs and the intestine. In his studies of obesity, Newburgh has measured these various fractions by intricate methods, and finds that a diet inadequate in caloric requirements always causes a loss of flesh, but that this loss may sometimes be entirely masked by coincident retention of water. He concludes that there is no specific metabolic abnormality in obesity and that all obesity is therefore "simple" obesity, indicating a failure of the primitive instinct to adjust the inflow of energy to bodily needs. He reminds us that, while an obese patient may, in all good faith, deny that he overeats, close cross-examination will often show that he is confusing food bulk with food value.

While Newburgh's work helps to clear away some misunderstandings, it does not offer a complete explanation of obesity. It may be, as he suggests, that the overnutrition is usually due to unconscious habitual overeating. Yet it would be unwise, in the absence of further evidence, to ignore the possibility that primary derangements of such organs as the pituitary and the hypothalamus are to some extent to blame.

[1] Jour. Amer. Med. Assoc., 1931, xcvii., 1659.
[2] Jour. Biol. Chem., 1922, liv., 783.

A GUIDE TO THE ACTIVITY OF RHEUMATIC INFECTION.

THE importance of the sedimentation rate of the red cells as an indication of the presence or absence of active infection has long been recognised. Almost immediately after the introduction of the test by Fahraeus it was adopted as a means of following the course of pulmonary tuberculosis and it is now generally admitted that, provided too much attention is not paid to single examinations and the observer adopts a reasonably critical attitude, it is of considerable value in this condition. Hitherto, this has been almost the only field in which it has been consistently applied, but in our present issue Dr. Payne, working at the Hospital for Sick Children, and Drs. Bach and Gray Hill, working at St. Bartholomew's Hospital and at Queen Mary's Hospital, Carshalton, describe their application of the test to rheumatic infections in childhood. The practitioner dealing with a case of acute rheumatism in a child is faced, once the acute symptoms have subsided, with the dilemma that he may keep the patient invalided too long or may let him up too soon with resulting irremediable damage to the heart. Every practitioner of wide experience can think of children who have been allowed up too soon and in whom cardiac lesions have developed resulting in chronic invalidism and possibly in death; on the other hand, there are no doubt hundreds in bed at the present moment who might be up and about, and going on with their schooling, if only there were some reliable guide to the subsidence or otherwise of the acute inflammatory state. The results obtained independently by Dr. Payne and Drs. Bach and Gray Hill give good grounds for believing that in the sedimentation rate of the red cells we have the necessary criterion. These observers agree that the persistence of a sedimentation rate of less than 10 mm. in the first hour shows subsidence of the infection, while a higher rate is an indication for further rest in bed. Up to the present the sedimentation rate in its application to children has shared with most other "blood" tests the disability attaching to the withdrawal of large amounts of blood; in dealing with children none but the most hardened or those most assured of the benefits likely to accrue from the procedure can face this with equanimity. The technique described by Dr. Payne to some extent does away with this drawback and in the hands of reasonably careful workers should prove accurate enough for clinical purposes.

CARBON DIOXIDE AND SPINAL ANALGESIA.

THE use of carbon dioxide in connexion with anæsthetics, following chiefly from the work of J. S. Haldane and Yandell Henderson, is being repeatedly demonstrated and recommended. The latest contributions to the subject is a paper by C. A. Roeder [1] dealing with the aid which CO_2 can give in those cases, not very uncommon, in which respiration fails after intrathecal injection of an anæsthetic for spinal analgesia. The physiological explanation of both circulatory and respiratory failure in spinal analgesia is still variously given by different authorities. Roeder holds that respiratory failure

[1] Amer. Jour. Surg., November, 1931, p. 454.

is due either to paralysis of the phrenic and intercostal nerves, or else to ischæmia of the respiratory centre, owing to extreme fall of blood pressure produced by the injection. When the first cause is at work only artificial respiration can effectively remove the disability, but when the second cause is alone active then inhalations of carbon dioxide are of great service. Roeder gives CO_2 during the time of spinal anæsthesia, and, if necessary, two hours afterwards. This he says may carry the patient over an acute emergency, for by making the respiration continue the thorax "acts as a temporary heart providing that the motor nerves of respiration are not blocked." Inhalations of 4 per cent. CO_2 increase the pulse-rate and raise the blood pressure. A percentage of 10 causes headache and mental confusion. With higher percentages the heart-rate drops and the blood pressure, temporarily raised, soon falls with cessation of respiration. Roeder is of opinion that so far from doing away with the necessity for an anæsthetist, spinal anæsthesia demands one of greater training owing to the greater frequency of serious complications. And he should be armed with apparatus for artificial insufflation of the lungs with CO_2 and oxygen. In most operating theatres nowadays cylinders are available containing 5 or 7 per cent. carbon dioxide in oxygen. In private practice, when perhaps this kind of apparatus is not at hand or cannot conveniently be used, the anæsthetist can easily carry his own carbon dioxide by means of an excellent portable apparatus now on the market[2] consisting of small metal cylinders about 7 inches long and less than an inch in diameter, fitted into a neat holder. Delivery of the gas is made very simple; the apparatus is easy to work; it does not take up much room in the doctor's bag; and is not likely to be exhausted by use in one case. The cylinders are, moreover, inexpensive in the first place, and can be refilled at a very small charge.

INFECTION AND HEPATIC FUNCTION.

As was emphasised in a recent discussion at the Medical Society of London,[3] the great majority of tests of liver function must, from the clinical point of view, be regarded as valueless. Indeed probably only the van den Bergh and the galactose or lævulose tolerance tests can be said to have any practical application, and that a limited one. The reason for this is partly the complexity and number of functions of the liver, partly the great reserve powers of the organ, and partly, too, the fact that several of the activities previously ascribed exclusively to the liver are also carried out by the extra-hepatic reticulo-endothelial system. Experimental evidence indicates for instance that the excretion of bromsulphthalein (a test of liver function formerly advocated and now largely discarded) is influenced both by blocking the reticulo-endothelial system with Indian ink or by reducing its functional capacity by removal of the spleen (F. Schellong and B. Eisler[4]). An attempt to correlate the results of this test with estimations of serum bilirubin in health and in various infective conditions is included by C. W. Herlitz[5] in his recent investigation carried out on groups of children between the ages of 6 months and 12 years. He found that while the bilirubin values were raised in 65 per cent. of the infections due to streptococci, they were normal in the great majority of respiratory or urinary infections due to other organisms. Bromsulphthalein excretion, however, which was studied in a smaller series of cases, showed impairment in 12 out of 15 infective cases, irrespective of the type of organism responsible. There was thus no parallelism between the results of this test and the bilirubin content of the blood. This was further illustrated by the fact that normal bromsulphthalein excretion occurred in cases of hæmolytic jaundice—a condition in which the functional activity of the reticulo-endothelial system is probably unimpaired. In view of his own findings and of the experimental evidence, Herlitz concludes that the bromsulphthalein test is a test of the function of the reticulo-endothelial system rather than specific for the liver cells. He also thinks that hyperbilirubinæmia, when it appears in infective conditions, may be attributed primarily to increased destruction and formation of bile-pigments in the reticulo-endothelial system, the increase being inadequately compensated for by increased excretion.

[2] Obtainable from Sparklets, Ltd., Upper Edmonton, N.18.
[3] See THE LANCET, 1931, ii., 1227, 1228, and 1238.
[4] Zeit. f. d. ges. exp. Med., 1927–28, lviii., 728.
[5] Acta Pæd., 1931, xii., Suppl. V.

THE CORONARY BLOOD FLOW.

EXPERIMENTAL work on the blood flow through the coronary artery when it is perfused at a constant pressure has shown that the flow is either stopped or greatly diminished during systole, and that the main flow takes place during diastole. But in the intact animal the coronary system is subjected to perfusion not at a constant pressure, but at one which varies widely during each cardiac cycle according to the changes in the intra-aortic pressure. Observations made 60 years ago by F. Rabatel and recently by M. Hochrein and his co-workers on the circulation through coronaries remaining in connexion with the aorta has given results which are the reverse of those obtained when the artery is perfused at a constant pressure. It was found that besides an increased flow in diastole there was an increased forward movement of blood in the early phase of systole. This was attributed to the increased pressure within the aorta which occurs at this time. These discrepancies are settled by the experiments of G. V. Anrep and his co-workers.[1] They first determined the maximum pressure in the artificially perfused coronary artery at which systole still arrested the flow. This was found to be considerably in excess of the maximum aortic systolic pressure; and in no case, whatever the difference between the aortic systolic pressure and the perfusion pressure, was an increased coronary flow observed to take place during systole. It is obvious from this experiment that the flow must be arrested in systole in an aorta-perfused coronary. This conclusion was confirmed by experiments on the aorta-perfused coronary in which a stromuhr was inserted between the aorta and the coronary cannula. Under these conditions it was found that the coronary pressure is the same in systole as when it is clamped, again indicating that the contraction of the heart stops its arterial circulation. A considerable rise in systolic pressure had very little effect on the flow, but a slight rise in diastolic pressure caused a considerable increase in the flow—for example, a rise of 4 mm. in pressure increased the volume by more than 10 per cent. The inevitable conclusion to be drawn from all these experiments is that the volume of the blood flow through the coronary system is maximal during diastole and minimal during systole. Further analysis of the rapid and detailed changes in the flow was made with the stromuhr modified in

[1] Anrep, G. V., Davis, J. C., and Volhard, E.: Jour. Physiol., 1931, lxxiii., 405.

an ingenious way. A tube containing a mercury droplet was introduced into the instrument, and by photographing the movements of the droplet the changes in the blood current could be ascertained. These experiments disclosed a striking difference from the first series of observations; a forward movement of the mercury droplet occurred not only during diastole, but again during the early part of systole. This suggested that an increased coronary flow took place during early systole, as well as in diastole, as Rabatel had claimed. This, however, is an unjustifiable deduction, for the same forward systolic movement of the droplet was found when the coronary capillaries were blocked; it is determined by the elastic expansion of the coronary artery caused by the rise in pressure which accompanies systole, but not by an increased flow through the organ. Thus in a series of beautiful experiments are the inconsistencies between the results of various observers settled, and the belief that the main blood flow through the coronary system occurs during diastole is confirmed.

PLASTIC SURGERY OF THE NOSE.

THE nose is perhaps the most conspicuous feature of the face, and any exaggeration, loss, or deformity thereof becomes an object of undesired attention, and is likely as well to produce disquieting self-consciousness. The extent to which individual noses vary in size and shape without transgressing the limits of the normal is very great, but, to be acceptable, the nose must be in harmony with the features among which it has its setting. The surgeon may be consulted, by reason of appearance or impaired function, concerning the possibility and advisability of changing or restoring a nose which is not satisfactory. The task of giving advice on such a matter is not as simple as it may appear, and we welcome two papers, containing much useful information, which have recently appeared.[1] The first, by G. B. New and F. A. Figi of the Mayo Clinic, deals with the reconstruction of the larger defects by means of pedicled flaps, usually taken from the forehead. The details of the method have been immensely improved since its original introduction as the "Indian" operation very many years ago, in the care and accuracy with which the flaps are fashioned, and more particularly in the adoption of the principle that all flaps covering a cavity must have a lining of skin on both surfaces. New and Figi lay stress on the importance of the mental attitude of the patient in these operations, as in any plastic procedure for improving personal appearance, and state that the operation must be requested by the patient rather than submitted to because advised by the surgeon; for otherwise the patient is not likely to be pleased with even a good result and will chafe at the length of time and the number of operations required. In the second of these papers, by V. P. Blair and J. B. Brown, the correction of smaller cosmetic defects, as well as of the larger deformities, is discussed, and in these the mood of the patient assumes even larger proportions. As they say, it is a general working rule that, the more pronounced the deformity, the more likely is a reasonably good result to be acceptable; but, conversely, it is well to be cautious about embarking upon the correction of slight defects. Adolescents of both sexes, especially those who have no regular employment, are more apt to be over-particular than older people. A patient's inability to state clearly the particular thing that displeases him should excite the surgeon's doubt of his own ability to satisfy; this same uncertainty should also arouse the suspicion that the real fault may not lie in the nose at all, for not seldom a too short or too large chin may be the real but unrecognised offender by disturbing the balance of the features. The all-important details of the numerous plastic procedures are too intricate for brief consideration, and our object here is rather to emphasise the importance of considering the patient's psychological reactions to his, or her, deformity.

[1] Surg., Gyn., and Obst., December, 1931, pp. 780 and 797.

AN UNUSUAL TREATMENT FOR PEPTIC ULCER.

EVEN if we believe that the thorough treatment of peptic ulcer by diet and alkalis, on the lines first laid down by Sippy, gives far better results than were achieved before it was introduced, and even if we are unstinted in our admiration of the surgical treatment of chronic peptic ulcer when the operation is performed by a first-class surgeon, we must admit that both methods leave a proportion of inexplicable failures which are a cause of distress to patient and practitioner alike. The ulcer which yields readily to medical treatment is perhaps the ulcer which gives also the most satisfactory results when treated surgically, and, conversely, the very extensive chronic ulcer which does not prove readily removable at operation presents an equally difficult therapeutic problem to the physician. These facts lend additional importance to any novel therapeutic procedure which is backed by authoritative testimony to its frequent or occasional efficacy. On another page of this issue will be found a paper by Prof. Glaessner, of Vienna, who has for some years been using injections of pepsin in the treatment of gastric and duodenal ulcer. He thinks there is evidence of a biological difference between the gastric juice of normal persons and of those suffering from peptic ulcer. On injecting gastric juice from such subjects beneath the skin of a guinea-pig or painting the same substance on the cornea of the animals, he finds that the erosion caused by the juice from an ulcer patient is far more extensive and far slower in healing. Again, he has succeeded in producing artificial ulcers of the skin and mucous membranes of rats, guinea-pigs, and rabbits by the intracutaneous or intramuscular injection of gastric hydrochloric acid, and he has found that the subcutaneous injection of pepsin will notably accelerate healing in such cases. Acting on the results of these (perhaps somewhat scantily controlled) experiments, he has passed on to the treatment of ulcer in human beings by similar injections. The pepsin employed is not sterilised, but is filtered through porcelain under pressure, to rid it of albumin; diluted carbolic acid is added as an antiseptic and a 1 per cent. solution is finally obtained. The injections are said to be harmless and painless. Each patient is given about 30 injections twice yearly, the amount increasing as the series proceeds. Six hundred cases have been treated, and Prof. Glaessner claims that very good results were obtained in fully two-thirds of the 130 which were thoroughly controlled. Objective and subjective cure was brought about in these, although in at least half of them no change was observed in the acid secretion of the stomach before and after treatment. Of all his cases only 6 per cent. required surgical interference.

In assessing the value of these injections it must not be forgotten that certain routine medical treatment was employed simultaneously. Olive oil was given before meals, and an alkaline powder containing bismuth was taken in addition. Preparations of

belladonna and sodium bicarbonate were completely avoided. If there had been no hæmorrhage a mixed diet was utilised at first, but in some severe cases milk and cream was prescribed; and in general the mixed diet described by Prof. Glaessner appears to approximate to that recommended by the majority of physicians in this country. In these circumstances it may well be argued that the pepsin injections played a secondary part in the treatment, but the claims of Prof. Glaessner cannot be overlooked, especially as he has found his method of treatment of use in such resistant conditions as jejunal and œsophageal ulcer, as well as for the simpler lesions in more usual situations. As a practical suggestion the method seems to deserve investigation in this country, while its theoretical aspect is of interest in relation to some of the observations on hydrochloric acid mentioned in our leading article last week.

THE LYMPHOID TISSUE IN THE LUNG.

AN interesting communication on the lymphoid tissue in the lung, by Drs. F. W. Simson and A. Sutherland Strachan, reaches us from the South African Institute for Medical Research.[1] The authors believe that the lymphatic apparatus of the lung is the decisive factor in the localisation of inhaled dust particles, and in the development of pneumokoniosis. According to their observations, dust-laden phagocytes pass from the alveoli of the lung to small intra-pulmonary collections of lymphoid tissue, and from these into the lymphatic vessels which drain into the extra-pulmonary lymph nodes. Presumably the escape of phagocytes must be fairly complete, for the tracheo-bronchial lymph nodes may show typical silicotic fibrosis before recognisable changes occur in the lung itself. Nevertheless, a certain amount of dust is retained in the lung, and this progressively increases with the gradual obliteration of the lymph drainage system. The demonstration of the localisation of lymphoid tissue in the lung is by no means easy. It is widely scattered and consists of minute aggregations of lymphoid cells with, possibly, a supporting reticulum, but the nodules are indefinite and difficult to distinguish. They may be more prominent in congestive and inflammatory states of the lung, but in these conditions it is impossible to be certain that recognisable collections of lymphocytes represent a simple exaggeration of the normal distribution; they may well be pathological new formations. In the search for material suitable for their needs, it occurred to the authors that the lungs of children said to have died from "status lymphaticus" might present such a hyperplasia of the normal lymphoid tissue as to make its distribution clear. Whether or not the diagnosis of the cause of death in these cases could be substantiated is immaterial; it is sufficient that the authors obtained lungs which, while apparently free from changes due to previous disease, presented a very definite increase of lymphoid tissue. And after careful comparison with many other lungs it seemed certain that these hyperplastic areas were normal in their distribution. Their preparations, some of which are admirably illustrated in the paper, have convinced Dr. Simson and Dr. Strachan that previous descriptions of the distribution of lymphoid tissue in the lung are in need of modification. It has been described, for example, as occurring along the course of the pulmonary artery and at the junction of the smaller tributaries with the larger branches of the pulmonary veins. But in this series of cases, the distribution of lymphoid tissue is in strict relation with the respiratory tract, and is in no way related to the vascular system except in situations where air passages and blood-vessels come into juxta position; and even here it seems clear that the association is in no sense physiological but purely anatomical. Lymph channels traverse the lung, of course, in close relation with blood-vessels, but in no part of their course do they appear to be interrupted by lymph nodes; these appear to be functionally related to the air tubes, and the air tubes alone. The authors discuss the application of their observations to the localisation of infections as well as dust, and suggest that chronic tuberculosis of the lung affects first the lymphoid tissue when the infecting dose is minimal. Further work on these lines is in progress, and the subject appears to be one well worth pursuing.

[1] Lymphoid Tissue in the Lung. Its Distribution as Illustrated by a case of "Status Lymphaticus" and its Importance in the Localisation of Inhaled Particulate Matter. By F. W. Simson, M.B., Ch.B. Edin., and A. Sutherland Strachan, M.A., B.Sc., M.D. Glasg. Publications of the South African Institute for Medical Research. 1931.

A GREAT JOURNALIST.

THE bond between editors, whether of technical journals or of daily newspapers, is, or should be, a common ideal. Whether the screen on which they display the moving picture of their times is large or small, neither editors nor the journals they conduct will gain recognition or esteem unless they see to it that the light which illuminates the picture throws a steady beam of truth. The public from whom they seek support may be drawn from all classes and schools of thought, or may follow a special discipline, but it is quick, and growing rapidly quicker, to detect distortions, omissions, or artificial devices in the presentation of facts. These reflections arise from the news of the death of a great journalist, C. P. Scott. Every journalist has been assailed by the temptation to adjust facts to support a theory or to fit a policy, and learns early to regard integrity in this respect as a major virtue in his colleagues. This virtue, with many others, was in Scott, and his good repute will long be a public memory.

Mr. Wilfred Trotter, F.R.S., has succeeded Sir Hugh Rigby as sergeant-surgeon to the King, and Sir Hugh becomes an honorary surgeon to His Majesty.

Dr. George Proctor Middleton has been appointed surgeon apothecary to H.M. Household at Balmoral, in place of Sir Alexander Hendry, who has resigned.

The King has nominated Mr. Douglas Hacking, M.P., to be for five years a member of the General Medical Council, in succession to Sir Edward Hilton Young, now Minister of Health.

THE Hunterian Oration of the Royal College of Surgeons of England will be delivered on Monday, Feb. 15th, at 4 P.M., at the College by Mr. Wilfred Trotter. In the evening a dinner will be given by the President and Council of the College.

HOSPITAL GROUNDS AS BIRD SANCTUARY.—The South Staffordshire joint small-pox hospital board has refused to entertain an application for the letting of shooting rights in the grounds of the hospital. The reason given is that, as the result of the scheme of afforestation some years ago, the waste land on which the hospital was originally placed has become a bird sanctuary.

SPECIAL ARTICLES

CATTLE RINGWORM IN MAN.

BY GEORGE ASHTON, M.D., M.R.C.P.

THE Ministry of Health recently had occasion to consider the question of the prevalence in this country of cattle ringworm in man. The literature on the subject was consulted, and further information obtained through a special inquiry made by the regional medical staff of the Ministry of Health, who interviewed 384 insurance practitioners in England and Wales whose practices were thought likely to afford opportunities of observing persons affected by the disease. It devolved upon me to collate and summarise the information thus obtained, and it is thought that the following summary may be of interest more especially to medical officers of health and practitioners in agricultural areas.

Historical.—At the end of the eighteenth century there were references to contagious skin affections implicating the body, head, and shoulders of animals, and in 1820, Ernst, a veterinary surgeon in the canton of Zurich, described a case in which a young girl was infected from a cow. Carrère, in 1838, noted that the virus might remain for a long time in stables and advised burning harness and cleaning any other objects, which might have been rubbed by the infected animals. Letenneur pointed out, at about the same time, that cattle ringworm is most common in the spring after the animals have spent a long time in their winter quarters. He advocated quarantine of the infected animals. Malmsten, in 1845, discovered a vegetable parasite, which he then called the "Trichophyton tonsurans" and which belongs to the hyphomycetes or moulds. A similar fungus was identified by Gerlach, in 1857, as the cause of ringworm in domestic animals.

The fungi causing diseases of the hair and skin can be divided into two groups, the microsporons and the trichophytons, distinguishable by differences in mycelium and in fructification. The microsporons, which are responsible for the common forms of ringworm of the scalp, are not (with quite unimportant exceptions) concerned in the ringworms of animals which are communicable to man. The trichophytons may be classified as follows:—

(1) *T. endothrix*, affecting the interior of the hair and not primarily the skin, and perhaps exclusively of human origin (large-spored ringworm of the scalp); there are several varieties (? species) including *T. crateriforme* of Bodin (1902), which is possibly the equivalent of Malmsten's "T. tonsurans."

(2) *T. neo-endothrix*, intermediate in mycological character between the human and animal classes and affecting both hair and skin in human beings; one variety has been found in cats; others have not been proved to occur in animals.

(3) *T. ectothrix*, the class which chiefly gives rise to disease in animals. These fungi affect chiefly the skin and produce in man the typical circinate lesions of cattle ringworm. One group of these fungi has small spores resembling those of the microsporons and contains several varieties (? species). This group attacks horses and dogs. The other group has large spores and also contains several varieties among which are some causing ringworm both in cattle and horses. Of this group, and particularly common in cattle, are the faviform varieties, *T. album* and *T. discoides*, which produce in culture a mycelium like that of favus; but the lesions are characteristically ringworm in character and the fructification forms of the fungus of favus are absent.

THE INFECTION IN ANIMALS.

Incidence.—Bovine animals are most readily affected with ringworm, especially young stock animals. Calves are the chief sufferers, and the disease seems to be relatively rare in dairy animals. Dogs and horses are also susceptible. Goats and cats suffer more rarely; pigs and sheep hardly at all. Cattle ringworm is fairly common in this country, but seems to be limited to certain districts. It also appears to be more prevalent in England, Holland, France, and Switzerland than in other parts of Europe.

Mode of infection.—The transfer of the fungi of cattle ringworm from the infected cattle to other cattle occurs: (*a*) By direct contact, especially during pasturage. Bulls, in particular, may transmit the infection to a whole herd. (*b*) By indirect contact through the indiscriminate use of infected combs, brushes, clipping-machines &c., or by healthy cattle rubbing against infected rubbing-posts, stalls, railings, and gates.

Clinical manifestations.—At the commencement of the disease the characteristic signs are clearly defined circular areas of cutaneous inflammation, either hairless or studded with broken hair; these areas are generally seen on the head and neck and more rarely are scattered over the whole body. Their frequency on the head and neck is largely due to cattle scratching and biting each other on the head and neck, and to the use of infected rubbing-posts. The patches, which are at first the size of a pea, extend at the circumference and may attain the size of a crown-piece or the palm of the hand. They are usually discrete, but may coalesce to form larger areas. Later, vesicles are formed which quickly burst and dry up to form thick crusts and scabs, which may be of a greyish-white or yellowish colour and of a leathery consistence. The presence of these scabs no doubt accounts for the disease being known popularly as "dry scab" and "scab mange." Healing usually proceeds under the scabs, which gradually fall off, leaving slightly scurfy bald patches upon which the hair slowly grows again. On its first appearance, and also during the healing process, the eruption causes itching. The eruption generally lasts from 6 to 12 weeks, but if the normal course is disturbed by rubbing or scratching, fresh outbreaks occur within the healed patches and the ailment may be prolonged for 6 or 12 months or even longer.

THE INFECTION IN MAN.

Incidence.—88 of the 384 practitioners interviewed by the regional medical staff stated that they had not seen any cases of cattle ringworm in man. Of the 296 practitioners who had seen cases, 132 volunteered the statement that the disease rarely came under their observation, the number of cases seen varying from two cases in 25 years to five in one year. Several expressed surprise that, considering the large number of people exposed to infection, the disease did not come more often under their observation. The disease is commonest in persons who work amongst cattle, such as farm labourers. Farm workers who handle calves are particularly likely to be infected, the disease being, as already stated, very common in calves, especially during the colder months when they are confined indoors. Ringworm is not so common in milch cows, and for this reason milkmaids and dairymaids are not especially liable to contract the disease. Many cases of ringworm derived from horses and mules were seen in men attached to mounted units and transport services during the late war.

Mode of infection.—The disease in man is generally derived directly from infected cattle, but infection sometimes arises indirectly from contact of the hands and wrists with walls, gates, posts, &c., against which infected cattle have rubbed.

Clinical manifestations.—The disease appears to be

limited to exposed parts; the hands, wrists, forearms, and upper arms are the parts most commonly affected, since they are those most liable to come into contact with the infected cattle in handling them. The custom amongst farm workers of working during the warm periods of the year with their coats off, and their shirt sleeves rolled up, may also increase the risk of infection. The disease occasionally spreads to parts which are liable to be scratched by the affected hands, such as the head and neck. Occasionally the cheek and forehead are affected through a milk-maid resting her face on the flank of the infected cow whilst milking. The disease may occur around the mouth in children, through kissing and fondling young calves.

The disease may appear as: (1) Rings of inflammation, which may be scaly, vesicular, or pustular. The degree of inflammation varies, but as a rule it is more intense than in lesions due to purely human parasites. (2) Patches or plaques of inflammation which have a rounded or festooned outline. These plaques may be scaly or show vesicles and pustulation.

Persons who have contracted ringworm from cattle are sometimes seriously affected, owing to:—

(*a*) The wide extent of the original infection.

(*b*) A secondary infection of the ringworm patches by septic organisms. This may be facilitated by treatment with drastic local remedies, such as strong cresol preparations, which have been supplied by the neighbouring chemist or veterinary surgeon for use on cattle. The indiscriminate application of these remedies damages the skin, and so provides a suitable habitat for septic organisms.

(*c*) Involvement of the beard region, which may result in inflammation and suppuration of the hair follicles with surrounding infiltration of the skin.

(*d*) Involvement of the scalp, which may result in raised, boggy, phlegmonous swellings with numerous small abscesses, and may lead to inflammation of the glands of the neck.

(*e*) Involvement of the nails, with suppuration; this condition, however, is very rare.

Constitutional disturbance is rare except in cases in which there has been secondary infection by septic organisms; symptoms of septic absorption of varying severity may then occur.

Occasionally the infection in man may assume epidemic proportions. Thus in 1840 most of the inhabitants of the Swiss village, Andelfingen, were reported to be infected with ringworm by sick cattle. During the late war several extensive outbreaks occurred behind the French lines at Verdun, among men tending the large herds of cattle that had been assembled there for feeding the armies.

I am indebted to Captain W. Watt, M.R.C.V.S., of the Ministry of Agriculture and Fisheries, for the following notes on an outbreak of cattle ringworm which occurred at the Cattle-Testing Station at Pirbright in 1925.

The officers and attendants in attendance on the infected cattle were dressed in rubber overalls and sou-wester hats which were sprayed with 1½ per cent. solution of lysol and their hands were washed in this solution on leaving each box. Their hands and faces were washed with carbolic soap before leaving the compound. In spite of these precautions, the following members of the staff became infected.

A veterinary officer cut the point of his chin whilst shaving, and although tinct. iodi fort. was applied the wound began to pour out serum and the tissues began to swell. A second area developed on his chin and was quickly followed by more infected areas. One of the larger areas developed a ring-like appearance and the skin tissues were much thickened. Microscopical examination showed the infecting organism to be a species of *T. ectothrix* and the clinical features of the eruption were such as to make reasonably sure that the infection was with a fungus of animal origin, and not with one of the human varieties, which are in general rather less virulent. Under a simple starch poultice treatment the inflamed tissues gradually became normal but the officer was left with 13 small areas on his face, which are devoid of hair. The duration of the infection was two months.

Four of the attendants were affected. No. 1 was infected on the upper lip, which became more than twice the normal thickness for a time. No. 2 had an infection on the forearm and on the chin. The tissues in both areas were raised up, and had the appearance and colour of an over-ripe strawberry. No. 3 had an area on the back of his hand which poured out serum and developed a crater-like centre. No. 4 had a slight infection of the forearm, which yielded rapidly to treatment.

DIAGNOSIS.

A certain diagnosis of the disease cannot be made without a microscopical examination to demonstrate the presence of the causative fungus, but the large majority of those practitioners interviewed who had seen cases were satisfied that a sufficiently reliable diagnosis could be made from the history and the naked-eye appearances on the following grounds: (*a*) history of prevalence of the disease amongst cattle, or of the coexistence of cases of the disease amongst fellow workers; (*b*) occupation of the patient; (*c*) position of the patches of disease, generally on the hands or arms, a site which is uncommon in other forms of ringworm; (*d*) character of the lesions.

As a matter of fact, the patients usually diagnose the condition for themselves, through their knowledge that cattle affected with the disease are under their care, and that the affected parts are the hands and arms.

Differential diagnosis.—As contrasted with the commoner forms of human ringworm, the lesions of the animal variety affect more particularly the skin, and are peculiarly inflammatory in character; while the fact of contact with cattle obviously affected with ringworm is usually sufficient to settle the animal origin of the lesions. But, if scientific proof were required a complete research would be necessary in each case, establishing on mycological grounds the identity of the fungi cultivated from the human patient with the fungi cultivated from the suspected cattle.

Margarot and Deveze have drawn attention to the fluorescence of hairs infected by ringworm in light filtered through glass containing nickel oxide, known as Wood's glass. They have differentiated between the fluorescence of microsporon and tricophyton infections and state that hairs infected by tricophyton exhibit less fluorescence than those infected by microsporon, but still show a characteristic reaction. More recently Kinnear has reported that only microsporon infections give fluorescence which is entirely absent in tricophyton infections. The great value of these observations in human ringworm of the scalp is in ascertaining the completeness or otherwise of the cure. As neither the diagnosis nor the treatment of cattle ringworm in the human subject presents much difficulty, the method is not likely to be of much practical application in this condition.

PROGNOSIS, TREATMENT, AND PREVENTION.

Prognosis.—Most cases clear up in a few days, often without treatment. Cases, however, occur in which the disease spreads widely and may for weeks prove very resistant to treatment. Suppuration in the scalp or beard may be the cause of inconvenience and suffering for some months.

Treatment.—Most cases are so slight that they are readily cured by home remedies. Treatment by the local application of tincture of iodine or a cresol disinfectant, by the patient himself or by his employer, seems to be so well known and so effective that the large majority of patients do not seek medical advice. This may account for the fact that many doctors

with large practices in agricultural districts speak of the extreme rareness with which they see cases of cattle ringworm.

Prevention can be largely secured: (1) by issuing instructions to farm labourers, &c., as to the infectious nature of the disease; (2) by the provision on the farm of suitable places for washing and disinfecting the hands of those who have been in contact with infected cattle; (3) by wearing a washable overall whilst handling infected cattle and by wearing a washable cap whilst milking; (4) by calling attention to the danger of dressing sores, &c., on infected cattle with the naked hands instead of wearing india-rubber gloves—which should always be provided and worn for this purpose; (5) by cleansing and lime washing all rubbing-posts, stalls, railings, gate posts, &c., with which it is known that infected cattle have been in contact; (6) by preventing children kissing and fondling calves; (7) by ensuring the observance of Article 13, of the Public Health (Meat) Regulations, 1924, which prohibits the "blowing" or inflation with the human breath of carcasses of calves slaughtered for human consumption.

The more serious forms of the disease can be prevented by advising farm labourers and others to apply for medical treatment immediately on the first evidence of the disease.

My thanks are due to Dr. F. Griffith and Dr. W. M. Scott, of the pathological laboratory of the Ministry of Health, for their assistance in preparing the paragraphs dealing with the pathology of the disease.

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NORTHAMPTONSHIRE CONVALESCENT HOME.—Mrs. J. G. Shipman has given her late residence, Templemore, Dallington, as a convalescent home for the Manfield Orthopædic Hospital, Northampton, and it has just been handed over. It will be known as the John Greenwood Shipman Home, in memory of the late Dr. Shipman.

UNITED STATES OF AMERICA.

(FROM OUR OWN CORRESPONDENT.)

MILK CONTROL.

DURING the last eight years persistent efforts have been made by the public health service to unify methods and to raise the standards of milk production in the United States. These efforts have both a hygienic and an economic purpose. It has been found that frequent changes in municipal ordinances governing milk-supplies are very expensive to the dairymen, and keep up the price of milk to the consumer. The lack of uniformity in dairy equipment has also increased the price of such equipment to an uneconomic level. A uniform standard approved by high authority is also a great aid to local health officers, many of whom have more training in pharmacology than in the technical aspects of milk production.

Within eight years 444 municipalities, embracing a population of some 7½ million people in 25 States have adopted the standard milk ordinance, and are now working under the same system of dairy regulation. In the December number of *Western Hospital Review* Mr. Leslie C. Frank, the sanitary engineer in charge of the Office of Milk Investigation of the Public Health Service, reviews the achievements of this period. He points out that in the seven years 1924–1930 no less than 327 milk-borne outbreaks of communicable disease, 217 of these being outbreaks of typhoid fever, have been reported by State and city health officers. These represent only the outbreaks which have been traced to milk. The fact that the number of such outbreaks does not appear to be diminishing (there were 44 reported in 1930) may perhaps be due to increasing epidemiological skill which is offsetting improved regulation. At any rate the danger of insanitary milk is clearly demonstrated, and Mr. Frank argues that it is best met by the standard milk ordinance on the following grounds:—

The ordinance sets up requirements that guarantee a pure milk-supply. These deal with conditions on the farm as well as with conditions in the pasteurising and distributing plants. It also supplies the health officer with the most powerful available devices for enforcement of the regulations. The grading of milk is regarded as an enforcement device, for it is difficult to sell any milk that is not Grade A in this country. If withdrawal of the Grade A label does not enforce compliance the supply may be barred from the market by revocation of the producer's permit. Penalties are also provided.

What is known as the Public Health Service Milk Code takes up separately each item of the ordinance, explains the reason for it, and describes what may be regarded as the satisfactory limits of compliance. The dairy industry should be given a specified time in which to adjust itself to the new requirements, it being understood that at the end of that time the first announcements of grades will be made. Six months is generally considered to be an ample allowance for this purpose.

"There can no longer be any question," writes Mr. Frank, "but that authoritative and expert opinion is almost unanimously to the effect that all milk should be pasteurised." Tuberculin testing gives almost complete protection against tuberculosis. Stool and urine examinations and Widal tests may eliminate most typhoid carriers from among employees, but no one believes that such tests exclude all carriers.

Expert opinion, however, is divided on the best method of securing pasteurisation. Compulsion, especially in small communities, is often unjust to firms that are too small economically to install the necessary machinery and results in a monopoly of the milk industry by one firm. The health education of the people as well as the local conditions of the industry must determine whether and when pasteurisation shall be made compulsory.

CASUALTIES AT FOOTBALL.

Much discussion has taken place in the press of late regarding the hazards of American football. Deaths from football are not officially notifiable but 40 are known to have occurred during the autumn and winter of 1931. A few of these are attributable only indirectly to the game as that of a boy, aged 16, who was scratched at football and died of septicæmia two weeks later, or another who died about the same time having ruptured his appendix during a game of football and having concealed his injury until the end of the match. Such deaths could result from any form of sport, but the great majority of football deaths are due directly to violence and it is significant that of these 40 deaths only eight were college men, for in college football the greater strength of the combatants is made less dangerous by the greater skill of these highly trained players. It has been said that 40 deaths is not a large number compared with the number of automobile fatalities and this is true. On the other hand insurance companies do not penalise their clients for riding in automobiles, whereas they have of late refused to issue policies against accidental death and injury to football players except at unusually high premiums. Personal experience during four years as a college physician leads me to suspect that the disabling accidents of football are more important than the deaths, but I know of no published figures on this subject.

American football demands from its votaries so many hours of attentive study with a professor of football tactics (called a coach) and such exercise of memory that one marvels that it should be classed as a recreation. Perhaps the coeducational system is a factor in its popularity. For there is no doubt that a good football player exhibits qualities both of strength and of skill that endear him to the other sex. Perhaps, too, these very qualities rank higher in the scale of virtues adopted by a young nation than they do among the more sophisticated nations of Europe.

MEDICAL PRACTICE IN CALIFORNIA.

The latest study published by the Committee on the Costs of Medical Care concerns the medical facilities of San Joaquin County, California. The 100,000 people living in this county spent $3,609,063 on medical care in the year 1929 for the prevention and cure of illness. Physicians received 24 per cent. of this sum, hospitals the same proportion, drug stores (chemist's shops) 19 per cent., and dentists 16 per cent. About 3 per cent. of the total was devoted to public health activities. Of the 79 practising physicians, 14 are specialists, 18 are "partial specialists," and 47 are general practitioners. The specialists work 40 hours per week, the partial specialists 48 hours, and the general practitioners 57 hours. The median numbers of patients treated are respectively 900 for the specialist, 1475 for the partial specialist, and 800 for the general practitioner. The median net income for all physicians is $5455. The net incomes vary from a loss of $256 to an income of over $30,000. Seven osteopaths made an average net income of $5121, 14 chiropractors an average of $2781, 17 Christian Science practitioners an average of $1882.

AUSTRALASIA.

(FROM OUR OWN CORRESPONDENT.)

CONTRIBUTORY SCHEMES AND THE MEDICAL PROFESSION.

I HAVE previously referred to the crisis in the finances of the hospitals in Australia and some of the means adopted to relieve it. Most of the hospitals are largely dependent on government aid for their upkeep, and each State has taken different steps to meet the position. Thus in Western Australia a special hospital tax has been imposed, while New South Wales and Queensland have instituted Government lotteries.

New South Wales has now started a scheme of voluntary contributions which has given much concern to all medical practitioners of the State. It is not industrial, but is intended for the whole community, and people of every financial status are invited to participate. It is expected ultimately to absorb all existing schemes, but is otherwise not intended to interfere with the ordinary sources of revenue of the participating hospitals.

By a system of regular contributions of 6*d.* per week from every person willing to join, it is hoped to provide a regular volume of income. The main benefits are as follows:—

1. Contributors, who by reason of their financial circumstances are eligible for admission to a public hospital and are medically certified as requiring indoor accommodation in an acute hospital, shall not be required to make any payments to the hospital towards the cost of hospitalisation of themselves or their dependents, and shall not be required to pay any medical fees.
2. Other contributors will be given credit of 7*s.* per diem off the cost of accommodation for private or intermediate patients as the case may be, and shall only be required to pay the hospital the difference between 7*s.* per diem and the charges fixed for private or intermediate accommodation and medical fees as laid down.

Contributors and their dependents will be entitled to the benefits for a period of 12 weeks in any 12 months. X ray and other scientific services will be available free of charge to persons eligible for public ward accommodation, and for others at certain charges to the hospital, to be determined, together with the fees of the radiologist, pathologist, and so on. It is also proposed to establish a special fund for the purpose of supplying destitute persons, whether members of the fund or not, with artificial limbs, spectacles, and special appliances for the sole use of the patient.

The opinion of the profession in Sydney on this scheme is probably best expressed in resolutions which were passed at a meeting of the British Medical Association on Oct. 30th, in which it was agreed that any contributory scheme, industrial or otherwise, providing for out-patient services to the contributor is not acceptable. Further, the medical profession, whilst affirming its traditional principle of free treatment for the indigent sick, insists that its interests be conserved in regard to the other classes of the community by payment for services rendered. The profession is prepared to support the scheme, provided proper arrangements are made to safeguard the interests of medical practitioners in regard to intermediate and private patients.

The B.M.A. in Victoria has also had a scheme under consideration. It is a proposal for voluntary

insurance providing for domiciliary, investigational, and pharmaceutical services on the one part, and consulting and specialist, nursing, and hospital services on the other. Besides any capitation fee paid to doctors for any of the above services, the patient will be required to pay a visitation or service fee for each service rendered. It is further proposed to establish funds to provide cash benefits to assist in the payment of consultant and specialist services, and to assist in the payment of medical and surgical nursing. Where contributory schemes are initiated or under the control of lay bodies, it is resolved by the Victorian branch that the medical profession shall have adequate representation on the executive, that a proportion of the contributions shall be used solely for medical benefit, that all benefits shall be in the form of cash benefits to subscribers, and that contributors as such shall not be given any direct representation upon the executive.

The proposed contribution for nursing and hospital service and consulting and specialist service is 9*d*. per week; the cash benefits to subscribers are £2 per week for hospital expenses, up to £9 for consultant and specialist service, £3 3*s*. for confinement, and £1 1*s*. for an anæsthetic. For domiciliary, investigational, and pharmaceutical services the weekly contributions will vary from 5*d*. for single persons under 21 years to 1*s*. for a subscriber with a wife and more than two children. The service is to be limited to those whose incomes are below £208 per annum for a single man or woman, or £312 for a married man, with an additional allowance of £25 for each child. The service charges are to be 3*s*. 6*d*. for domiciliary service (or other sum agreed upon), 5*s*. for investigational service, or the price of X ray films, and half the present private prescription rates for pharmaceutical service. It is proposed that the scheme should first be tried in a selected district. The Victorian branch points out that—

> "Hospitals accepting money for services are to contributors no longer charities, but public utilities. The contributor is relieved of indigency and obligation, and offered service, including medical service, for sixpence a week for himself and his dependents. What makes the scheme so popular to everybody except the medical profession is that the hospitals sell nursing and medical service for sixpence a week and pay nothing for the medical service. This is paid for by (i) the thrifty independent middle classes, who struggle with higher medical fees, and (ii) by the medical profession."

These schemes are likely to have far-reaching effects on the present hospital system in its relation to the medical profession, and their outcome is difficult to conjecture.

RESUSCITATION OF THE APPARENTLY DROWNED.

During the summer months the Australian beaches are thronged with bathers, and as many as 30 or 40 persons have been carried out and rescued on one beach in a single day. The number of surf fatalities is surprisingly small. This is due to a very efficient organisation for rescue. Life-saving equipment is provided on all beaches, and on many professional life-savers are employed. The main credit is, however, due to voluntary associations, known as life-saving clubs, whose members are first-class swimmers, trained in all aspects of surf rescue and resuscitation. These clubs have houses on all the larger beaches, and their members form regular patrols. The clubs are grouped into an association known as the Surf Life Saving Association of Australia, which is responsible for the teaching of the various methods and for general coördination and control. It issues a handbook, and it has lately been reviewing the methods of resuscitation of the apparently drowned in its local application to the conditions of the Australian surf.

A committee of medical men which has been asked to report has made several important suggestions, and proposes, inter alia, that the treatment of shock be completely revised. It is recognised that resuscitation must take place at the water's edge, and that the patient must not be moved until it is complete. The present teaching is that while resuscitation is proceeding the patient lies on the cold sand in a wet bathing costume until it is finished, when "restoration of the circulation" is carried out by means of vigorous rubbing towards the heart, accompanied by firm slapping of the palms of the hands and the soles of the feet. It is recommended that this rubbing and slapping be entirely discontinued, and that, where assistance is available, the treatment of shock should be begun immediately the patient is brought ashore and whilst resuscitation is proceeding. The measures recommended include drying the patient, laying him on and covering him with a blanket, and the application of warmth.

The method of resuscitation advocated is the Schäfer method with a slight modification. Experimental investigation of pulmonary ventilation during artificial respiration was carried out by Prof. Whitridge Davies at Sydney University to decide a number of doubtful points, and it was found that an excess of ventilation was produced, and that any attempts to produce more ventilation by particular sites for application of the operator's hands or by placing the patient's arms fully extended above his head were unnecessary. The rate recommended was 12 per minute—i.e., five seconds for each complete swing; three forward (expiration) and two back (inspiration). This ratio, which is contrary to normal breathing, was recommended because in artificial respiration expiration is the active movement. Further, investigation of the blood of animals drowned in sea water showed a marked increase in the salinity of the blood of the left ventricle, and a dehydration of the blood.

The modification of the Schäfer method mentioned above refers to the position of the operator in regard to the patient. At present he works from the left side of the patient or astride his body; it is now proposed that he should straddle the patient's left knee between his knees. This gives the greatest ease to the operator, especially to his wrists, which are likely to become very tired.

Consideration is also being given to aspects which particularly affect medical men—e.g., the use of Hewitt's airway and inhalations of oxygen and carbon dioxide during resuscitation, intracardiac injections of adrenalin, and particularly the length of time for which resuscitation should be continued. In regard to this, it is recommended that it should be continued until recovery, or for at least two hours, and only discontinued on the advice of a medical man. Further, all who have been resuscitated must be admitted to hospital, and someone trained in the methods of resuscitation must be present with the patient until such admission takes place.

ENDEMIC TYPHUS FEVER IN AUSTRALIA.

Roughly 300 cases of typhus are known to have occurred in Australia, distributed as follows: Victoria, 1; Queensland, 55; South Australia, 143; Western Australia, 93; Tasmania, nil; New South Wales, 7. Probably many cases have been overlooked, and until the medical profession in Australia consider the possibility of this disease in all anomalous

lous cases, diagnosed as measles, typhoid fever, &c., it will not be possible to form any accurate idea of the incidence. It has only been known in New South Wales since 1927. The disease appears to be more common in males than females, particularly between the ages of 31 and 40 years, and during the winter months. The association of the prevalence of rats and mice has been particularly investigated, and, in South Australia, it has been thought that its incidence coincided to some extent with the demolition of buildings and consequent spread of rats. The tropical rate mite (*Liponyssus bacoti*), whose bite, it has been suggested, spreads the disease from infected mice, is known to occur in Australia, and, in fact, was first reported as a blood-sucker of man at Sydney by Hirst.[1]

THE LÜBECK TRIAL.

(FROM OUR BERLIN CORRESPONDENT.)

(*Continued from 1931, ii., 1429.*)

THE question whether B C G may in certain circumstances become virulent, which is of great importance to the accused, has been fully debated by numerous medical experts. The court thus has more and more become a medical forum, the presiding judge seldom interfering with the discussions of the experts, because he is anxious to avoid a possible quashing of the verdict by the High Court of Leipzig, which would mean a repetition of the whole trial.

Prof. Hans Much, of Hamburg, said that there are stocks of B C G which are innocuous, and others which may become virulent. He mentioned a report received by him from Bulgaria where there had been an accident similar to the one in Lübeck. Asked by the public prosecutor whether the B C G might have become virulent by cultivation on an albuminous medium with hæmatin, he answered that according to Petroff's view this might happen. Prof. Martin Hahn, director of the Hygienic Institute of Berlin University, said that Prof. Deycke had taken a great risk by producing B C G on an albuminous medium. It was unnecessary to have produced the vaccine in Lübeck at all, when it could have been purchased from the Robert Koch Institute in Berlin, or from the Pasteur Institute, which is prepared to send cultures and even emulsions abroad to places further away than Lübeck. Prof. Uhlenhut, of Freiburg, said that the efficacy of the Calmette method has not yet been proved. With Prof. Sesiffert he had in a single instance found, like Petroff, dissociation of the B C G into three different species. One of these was very virulent, and guinea-pigs vaccinated with it developed tuberculosis. If B C G may under certain conditions cause tuberculosis in guinea-pigs it is wrong, he said, to give it to patients without a previous test on animals. In Lübeck, however, something particular must have happened to cause so high a mortality: either the primary culture was virulent, or it was contaminated or exchanged. He was of opinion that there should have been a special laboratory for the production of the vaccine. The work done in Lübeck was done without enough care and without the sense of responsibility required when producing a vaccine for human beings.

Prof. Wilhelm Kolle, of Frankfurt, did not agree with Prof. Uhlenhut about Petroff's experiments. They had, he said, been repeated at the Robert Koch Institute, at the German Health Office, at the Pasteur Institute, and at his own institute for experimental therapy, and the results were always negative. He believed the disaster was due to mixing of the B C G cultures with the stock of bacilli from the Kiel laboratory. Sister cultures of the original B C G sent to Lübeck had been sent to Riga and to some places in France without doing any damage to the thousands of children vaccinated with them. Prof. Deycke then reported that he had made experiments on himself to ascertain whether the Kiel culture and the cultures obtained from organs of dead Lübeck infants were the same or different. He found that the cutaneous reaction produced by the Kiel culture was much stronger than that produced by the Lübeck culture. He showed photographs in which the different degree of reaction could be seen. Prof. Ludwig Lange, of Berlin, said that a cutaneous reaction was inadequate evidence. The original Kiel culture had certainly been altered by passage through the bodies of the infants.

[1] Bull. Entom. Res., 1914, v., 225.

IRELAND.

(FROM OUR OWN CORRESPONDENT.)

HONORARY FELLOWSHIPS.

AT their meeting on Jan. 1st, 1932, the President and Fellows of the Royal College of Physicians of Ireland elected two honorary Fellows, Sir Almroth Wright, F.R.S., and Mr. Edward Francis Stephenson. Sir Almroth Wright is, of course, an Irishman, and received his medical education at Trinity College, Dublin, whence he graduated M.B. in 1883. Among the honorary degrees and diplomas that he already possesses are the D.Sc. of Dublin University, and honorary Fellowship of both Trinity College and the Royal College of Surgeons in Ireland. Dr. Stephenson is himself a licentiate of the College which now grants him an honorary Fellowship, and is a Fellow of the Royal College of Surgeons in Ireland. His early professional work was as dispensary doctor in Dunmore, County Waterford, until some 20 years ago he was appointed a medical inspector of the Local Government Board of Ireland. In 1919 he became an acting commissioner and member of the Board, and after the change of government he was chief medical adviser of the Department of Local Government and Public Health. In that capacity he has had a great responsibility in the reorganisation of the medical services of the country, and in the development of public health work which has taken place in the last few years. The compliment paid him by the Royal College of Physicians may be regarded as a recognition both of the value of his public constructive work and of the esteem in which he is held as a just and capable administrator.

COVENTRY AND WARWICKSHIRE HOSPITAL.—Owing to financial pressure it has been decided by the board of management of this hospital that, as a temporary expedient, a registration fee of 6*d.* be charged to all new out-patients and 1*s.* to all new cases referred to the massage and electrical departments and to the X ray department; that medicine be supplied at the rate of 3*d.* for one week's prescription and 6*d.* for two or more weeks; that the maintenance charge for paying patients admitted on the lower scale be raised from 1½ to 2 guineas a week, and that all patients, except such as were admitted under contract, be asked to make a voluntary contribution towards their maintenance of not less than 2*s.* a day. Necessitous cases will always be treated free. It was roughly estimated that there would be a deficit on the year's working of nearly £8000, and an accumulated deficit on the general fund of £17,500.

GLASGOW'S NEW HOSPITAL.

(FROM OUR CORRESPONDENT IN SCOTLAND.)

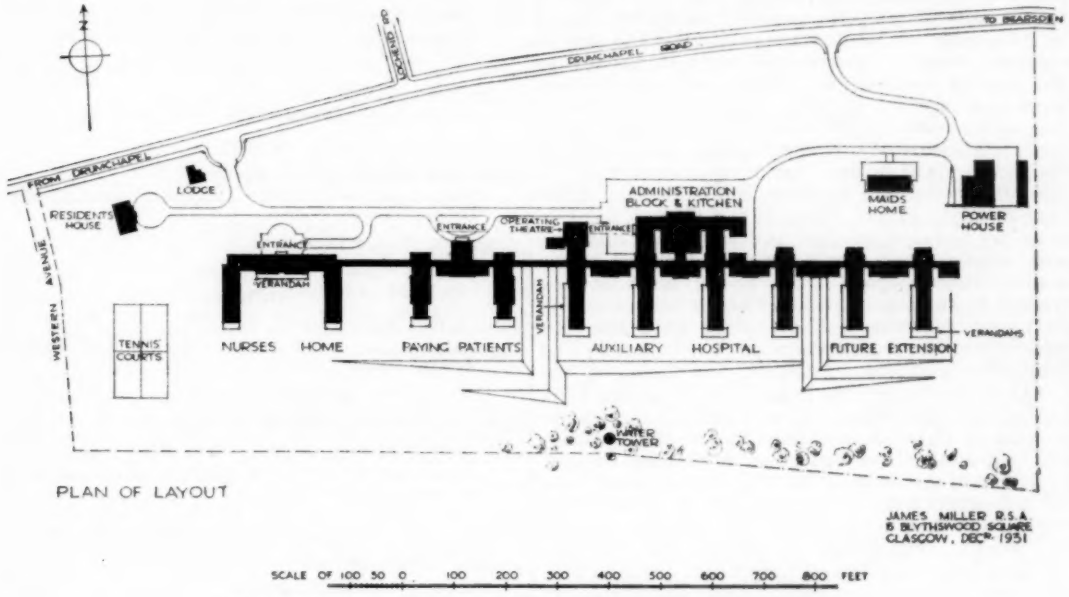
AT a time when many people shake their heads about the future of the voluntary hospital movement, it is gratifying to find that the managers of the Glasgow Royal Infirmary have taken a great new step. They have decided to provide a "pay" hospital for patients of moderate means, and a nursing home on the same site. Ultimately, these new institutions will accommodate 368 patients in the auxiliary hospital and 120 in the nursing home, a total of 488. This step forward has been made possible by two things: first, the enterprise of Mr. James Macfarlane, LL.D., chairman of the Royal Infirmary, who several years ago saw the need for this development and received contributions from many interested people towards it; second, a gift from Dr. Macfarlane and his brother of the additional site of 16 acres, making 32 acres in all, free of all burdens.

The architect, Mr. James Miller, F.R.I.B.A., of Glasgow, has provided the accompanying plan, which shows that the auxiliary hospital consists of six ward blocks, all placed on the south side of the main corridor. In addition to the large wards, which have 20 beds each, two small wards of four beds each are attached to each ward unit.

These smaller wards are placed on the south side of the main connecting corridor, with a large day-room for patients placed between. This arrangement allows these wards and day-room to have a southern aspect with an uninterrupted view of the grounds. Their windows, which will be of the sliding type, occupy the entire length of the room, and can be thrown completely open, transforming these apartments into large open balconies, so to speak, in fine weather. The above arrangement has the further advantage of reducing the length of the projecting main ward blocks, and, as the latter are spaced with ample space between, the depressing effect of the narrow and deep blind alleyways formed by the ward blocks, as found in many hospitals, is avoided. A new feature of the large wards is that the sanitary block is placed at the entrance end of the wards instead of at the extreme end, an open verandah taking the place of the sanitary block at the south end of each ward.

On the west side of all the main wards continuous verandahs are arranged with every alternate window in the ward formed as a French casement, so that beds can be wheeled on to the verandah. The side verandahs combined with the verandahs at the ends of the wards will be capable of accommodating the whole of the 20 beds in each ward. Instead of being placed at right angles to the walls the beds are placed parallel to the side walls, and each group of four beds is separated from the remainder by means of glazed screens of enamelled steel 7 ft. high. Every ward in the hospital and nursing home is planned with its main axis running north and south, thereby ensuring the maximum of sunlight.

The administration block is placed to the north side of, and central to, the ward section of the hospital. Advantage has been taken of the levels of the ground to place this block one storey below the ground floor of the main ward blocks, while a main service corridor on the same level as the administration block and connecting with it, links up all the ward units in the auxiliary hospital as well as the nursing home and the nurses' home, an arrangement which has the advantage of preventing general traffic passing through or near the ward units.



Royal Infirmary Auxiliary Hospital and Nursing Home, Cannlesburn.

The nursing home is placed to the west of the auxiliary hospital, and provides for 120 patients. The majority of the beds in this block are in single wards, while there are four wards containing four beds each.

The nurses' home is to the west of the nursing home and accommodates 128 nurses. A connecting corridor links up the home with all sections of the scheme.

The plan represents the complete scheme, and at present it is proposed to proceed only with the first section. No public appeal for funds has been made, and the sum available is only £75,000. But as the site is free, the managers propose to make a start by applying these funds for the purposes for which they were intended.

MEDICINE AND THE LAW.

"B.P." as a Description of Drugs.

IT is reasonable to say that to doctors and chemists the letters "B.P." indicate the British Pharmacopœia; when applied to medicinal preparations, they probably convey the same significance to members of the public. If private firms seek to market such preparations bearing the letters "B.P." as a trade description, there is obviously a risk of confusion and misunderstanding. The General Medical Council, which has statutory responsibilities of a national kind with respect to the British Pharmacopœia, has felt obliged to bring an action (reported in the *Pharmaceutical Journal* for Dec. 26th) against Barrett Proprietaries Ltd., manufacturing chemists of Blackburn, who have been using the letters "B.P." in marketing their goods. It is true that the Council is not a commercial undertaking financially affected by the sales of competing commercial undertakings; its functions are limited to publishing the list of standard drugs. Nevertheless, when it applied to Mr. Justice Clauson just before Christmas for an injunction against Barrett Proprietaries, it could reasonably protest that this marking of the defendant's goods was calculated to lead purchasers to suppose that the goods were of British Pharmacopœia standard. If the public were thus deceived, the reputation of the Council might suffer. Some of the Barrett preparations (for instance, stomach and indigestion mixture) were articles which would never be included in the British Pharmacopœia; the public must not be allowed to suppose that the Council was exceeding its proper functions and launching forth into the prescription or recommendation of stomach and indigestion mixtures. Attention was drawn to the fact that Mr. Barrett, the head of the defendant firm, had chosen the suffix "Proprietaries" though no proprietary rights were claimed for his preparations; had he done this in order to give some colour of right to the use of the letters "B.P."? On the other hand the defendants offered evidence that Mr. Barrett had been in the drug trade all his life, that he adopted the word "Proprietaries" because the company intended some day to sell proprietary preparations, that the company's goods thus marked had been on sale for some months, that the marking could not be changed without great expense, and that neither chemists nor anybody else would connect the Barrett "B.P." with the British Pharmacopœia.

At this stage the proceedings were in the form of an *ex parte* motion for an injunction. An injunction cannot be granted unless the party claiming it has sufficient interest in the relief claimed. The learned judge found himself unable to grant the injunction, apparently through doubt whether the Council could show pecuniary damage. The case will now proceed so that evidence may be heard on both sides. The judge's comments seem to show that the action initiated by the Council was not unjustified. Without anticipating the ultimate decision, he did not disguise his first impressions. He expressed surprise that honest traders, intending honestly to carry on business as sellers of drugs, should ask him to believe that they did not realise that this prominent use of the letters "B.P." would imply connexion with the British Pharmacopœia. Though the defendant company said it had incurred great expense in marketing its goods in this way, he would have been glad if they had asked for an opportunity of revising a method of trade which would hardly commend itself to high-minded traders.

NEW YEAR HONOURS.

THE list of honours issued on Jan. 1st contains the names of the following members of the medical and dental profession:—

Privy Councillor.

Major Walter Elliot Elliot, *M.C.*, M.B., M.P.
Financial Secretary to the Treasury.

K.C.S.I.

Major-General Sir Leonard Rogers, C.I.E., F.R.S., I.M.S., retd.
President of the India Office Medical Board.

K.C.M.G.

Sir James Kingston Fowler, K.C.V.O., C.M.G.
Member of the Colonial Advisory Medical Board.

K.C.V.O.

John Weir, C.V.O., M.B.
Physician-in-ordinary to the Prince of Wales.

K.B.E.

Frederick Norton Kay Menzies, M.D.
Medical officer of health and school medical officer, London County Council.

Augustus Moore Daniel, M.B.
Director of the National Gallery.

D.B.E.

Miss Edith Mary Brown, L.R.C.P.
Principal of the Women's Hospital and Christian Medical College, Ludhiana, Punjab.

Knights Bachelor.

George Buckston Browne, F.R.C.S.

Henry Hallett Dale, C.B.E., M.D., Sec. R.S.
Director-in-chief of the National Institute for Medical Research.

C.S.I.

Colonel John Philip Cameron, C.I.E., I.M.S.
Late Inspector-General of Prisons, Madras.

C.I.E.

Lieut.-Colonel John Morison, M.B., I.M.S.
Director of King Edward VII. Pasteur Institute and Medical Research Institute, Shillong, Assam.

C.V.O.

Marcus Antonius de Lavis-Trafford, M.V.O., O.B.E., M.D.
Physician-in-ordinary to the Duke of Connaught.

C.B.E.

Major Thomas John Hallinan, O.B.E., M.B.
Inspector-General of Health Services, Iraq.

O.B.E. (Military).

Surgeon Lieut.-Commander Andrew Lawrey, L.D.S.

O.B.E. (Civil).

Stanley Desmond Rieley, M.R.C.S.
Superintendent of Central Jail, Mach, Baluchistan.

Francis Alexander Innes, M.B., W.A.M.S.
Medical officer of health for Gambia.

Kaisar-i-Hind Medal.

William Nunan, M.D.
Police surgeon, and professor of medical jurisprudence at the Grant Medical College, Bombay.

PUBLIC HEALTH SERVICES

ANNUAL REPORTS OF MEDICAL OFFICERS OF HEALTH.

THE following are 1930 statistics of Belfast, Newcastle-upon-Tyne, and Cardiff.

Name of district and estimated (R.-G.) mid-year population.	Birth-rate.	Death-rates per 1000 of the population.					Death-rates per 1000 births.		
		All causes.	Tuberculosis.	Cancer.	Respiratory diseases with influenza.	Heart disease.	Infant and neonatal mortality.	Young child (1–5 yr.) mortality.	Maternal mortality in childbirth.
Belfast .. .. (415,151)	22·7	12·9	1·41	1·12	2·1	2·0	78/34	3·1	4·5
Newcastle-upon-Tyne.. (283,400)	18·4	12·6	1·30	1·39	1·8	2·3	74/34	30	5·4
Cardiff .. .. (223,900)	16·9	11·4	1·15	1·34	1·4	2·1	72/36	22	5·3

Notified stillbirths per 100 live births: Belfast, 4·7.
Registered stillbirths per 100 live births: Newcastle-upon-Tyne, 4·3; Cardiff, 4·9.

Belfast.

Dr. Charles S. Thomson records progress in maternity and child welfare work. The weekly sessions are to be increased from 6 to 19, 6 to be for antenatal work and 13 for infant consultations. The increase of the health visitors from 11 to 20 will enable attention to be given to the pre-school child.

Midwives are at present suspended for the purpose of disinfection when any cases of puerperal pyrexia occur, and provision is needed for compensation in such cases. The Nursing Home Act came into force in January, 1930, and during the year 53 applications were received, of which nine were refused.

About 8 per cent. of the milk samples are found to contain tubercle bacilli, and Dr. Thomson advocates that the municipality should only allow Grade A (T.T.) and pasteurised milk to be supplied to infants and mothers under their scheme. A curious point has arisen with regard to the notification of pulmonary tuberculosis. Only those cases are notifiable in which there is "positive" sputum.

Dr. Andrew Trimble, tuberculosis officer, points out that under the new regulations for insured persons, which came into force on Oct. 1st, 1930, the panel doctor is instructed to report "suspected" cases of tuberculosis. But Dr. P. S. Walker, medical superintendent of the sanatorium, points out that the type of case admitted is even more advanced than in previous years and that the sanatorium is not equipped structurally or otherwise for advanced cases, although quite satisfactory as a sanatorium. He points out that albumose or albumin is generally present in a positive sputum. It was only absent in nine out of 178 in recent examinations. He thinks that the presence of albumin in a negative sputum should be regarded as a reason for frequent examinations. He gives some interesting particulars with regard to pregnancy and tuberculosis. Out of 1113 pregnancies of tuberculous mothers, 63 ended in miscarriage, 17 in stillbirths, 13 in premature births, and 1020 in living full-term children. Of 1397 tuberculous mothers, 342 improved during pregnancy, 725 were in statu quo, 271 were in worse health, and 59 died within a year of delivery. The infant mortality-rate of 926 children born of 410 tuberculous mothers during seven years was 93, as compared with 102 for the general population. This agrees with the results obtained in Lancashire and Leeds, and may be due to the more careful supervision of these mothers.

The corporation pays £1000 annually to the maternity hospital (27 beds). A new maternity hospital, with 100 beds, is approaching completion within the grounds of the Royal Victoria Hospital. The Belfast Nursing Association employs 11 nurses for district work and receives no subsidy from the corporation. Dr. Thomson advocates an arrangement being made for the home nursing of measles and whooping cough by these district nurses.

There is great need of a large number of houses for the working classes. No fewer than 146 streets involving 3176 houses are known to the health department as requiring drastic treatment, and many new houses are required for these tenants. They are usually not in a position to pay the rent of the modern house, so that it is absolutely necessary to provide "kitchen" houses at low rents.

There are no private slaughter-houses in Belfast and over 5000 animals are slaughtered every fortnight at the municipal abattoir. A by-law for the compulsory use of the humane killer came into operation on March 19th, 1930.

Newcastle-upon-Tyne.

Dr. Harold Kerr says the hours of sunshine at Armstrong College were 1076, as against 1211 for the previous year, whilst near Morpeth the hours were 1323, as compared with 1566 in 1929. The city had therefore only three-quarters of the sunshine available for the neighbourhood. The regional committee for dealing with the smoke of Tyneside is without hope at present. The various gauges showed some improvement, probably owing to industrial depression. The citizens look forward to the advent of the "grid" and the abolition of the electric power station, with its three-fold deposit of ash. Smokeless fuel makes slow progress and Dr. Kerr and some medical confrères set an example by using gas-coke lit by gas burners, with a 10 per cent. advantage to their pockets.

As the result of the Local Government Act, 1929, the health committee took control of the poor-law infirmary, now called the Newcastle General Hospital; of the domiciliary medical service; of the care of boarded-out children; of poor children under 5 years; and of public vaccination. Progress has been made in the appointment of the new staff for the General Hospital and the redistribution of beds. Advanced pulmonary tuberculosis has been transferred to Walker Gate isolation hospital, for which a new pavilion will be needed. The top floor of the new block at the general hospital has been reserved for surgical cases of tuberculosis (72 beds). Already there is a shortage of beds at the general hospital and 200 more are needed. The public assistance committee controls the neighbouring institution and may remove elsewhere, thus releasing the institution for the use of the general hospital. Close coöperation is being maintained with the voluntary hospitals. The domiciliary medical service is likely to be converted to an open panel system, the patients to have their own choice of attendant and the health committee to be responsible for the dispensing of medicines. This system will be tried in about half the city, where there are vacancies at present and, if successful, will be applied to the rest of the town.

Diphtheria had again a low incidence, 200 cases with a case-fatality of 2·0 per cent., as compared with 259 in the previous year with a case-fatality of 5·4 per cent. Six Newcastle residents were affected by typhoid fever and 37 by paratyphoid B. Of 30 cases discovered in July and August, 21 had the same milk-supply. One carrier was found at the dairy but no suspicious circumstance at the supplying farms. The suspected milk was subjected to pasteurisation

and subsequently the dairy has been registered for milk pasteurised according to the regulations. Dysentery was discovered in 87 persons, five of whom died. Two small outbreaks occurred in a children's ward of the general hospital, each caused by a different type of bacillus. Antitoxin was used for 43 per cent. of the scarlet fever cases admitted to hospital, and is thought to reduce the cases requiring operation by the oto-rhinologist. There were 82 notifications of ophthalmia neonatorum, three of which resulted in slightly defected vision. Owing to the development of tuberculosis in a member of the Walker Gate staff, radiographic records are now taken of every nurse and maid employed, as a measure of protection both to the staff and to the committee.

The three new infant welfare centres have supplied a great need in the newer housing areas. Owing to a difficulty in securing health visitors a training course has been established in the health department. These subsidised pupils undertake to do their training, sit for examination, and remain for six months afterwards as health visitors. The successful ones have filled all the vacancies on the staff. The infant welfare and school medical services have been linked up and the records of the former are passed on with the school entrant.

Considerable alleviation of overcrowding is taking place. Since the war the housing committee has completed 5549 houses, as against 3297 by private enterprise. At the end of 1930 there were 1059 municipal houses in course of erection and provision has been made in the latest schemes for a small proportion of two-roomed houses for aged persons. The Act of 1930 has greatly facilitated progress with insanitary areas. The tenement by-laws are being vigorously enforced and the institution of proceedings in 88 cases, as compared with 198 in the previous year, indicates more compliance on the part of owners. During 1930 caravans were reduced in number from 22 to 5. All the eight swimming baths have been equipped with a continuous system of filtration and aeration. The kata-thermometer is used for testing the ventilation of cinemas and theatres. The standard adopted is that the cooling power should not be below six by the dry, nor below 18 by the wet kata-thermometer. Of the buildings tested 28 proved first-class and eight second-class.

Cardiff.

Dr. R. M. F. Picken says the health of Cardiff does not appear to be materially affected by the trade depression of the last ten years. Some significance may be attached to the greater proportion of school-children found to be suffering from defects and to an increase in ailments found among expectant, parturient, and nursing mothers at the clinics. It is satisfactory, he says, that tuberculosis—that sure measure of extreme hardship—shows no upward tendency. The absence of gross deficiency is a tribute to the efficiency of the various methods of public assistance.

On April 1st the city council took over the work of the poor-law authority, whose area extended beyond the city boundaries. The poor-law institutions were transferred on the understanding that a proportion of the accommodation would be available for the county. The hospitals were not separate from the institutions, but their control has been unified by the appointment of the medical officer of health as medical officer for public assistance. On the other hand, Llandough hospital (340 beds), which was in course of construction by the guardians, has been allocated to the health committee as a general hospital.

Diphtheria continued to be prevalent. The notified cases were 731, as compared with 735 in the previous year; and the case-mortality was 3·97 per cent. Owing to this increased prevalence a special effort was made to immunise as many children as possible during the summer, a medical officer, a nurse, and two clerks being told off for the campaign. Over 4000 children were immunised, at a cost of 3*s.* 7½*d.* per child. A table is given, showing the percentage of children at each age-period, who are presumed to be immune, in order to arrive at some measure of the influence of this effort upon the incidence of diphtheria in 1931 and subsequent years. Among the 42 notified cases of ophthalmia neonatorum no damage to eyesight was reported. The arrangement in 1929 made for the home nursing of pneumonia by the Queen's nurses was continued and 66 cases were referred to them during the year. Out of 322 cases of scarlet fever admitted to hospital, 52 received injections of scarlet fever antitoxin. The hospital mortality among 92 cases of measles was 5·4 per cent.

Dr. C. J. McSweeney gives an account of the work of the Lord Pontypridd Hospital, reserved for the treatment of children suffering from early rheumatism, which deserves wide publicity. The children admitted numbered 115, varying in age from 5 years to 14. An effort is made to exclude children with established heart disease, but in some cases valvular disease may have developed during the wait for beds, and it is the practice also to give the child the benefit of the doubt. During the year five children, classified on admission as having established valvular disease, lost all signs of it, whilst four others were regarded on discharge as presenting only minor cardiac manifestations. Among 100 cases treated to a conclusion in 1930 the proportion of normal hearts was raised from 15 to 60. The recovery-rate would have been higher still if every case of active carditis could have been admitted immediately on ascertainment. On two years' experience Dr. McSweeney estimates that 35 beds would be a reasonable provision instead of the 24 available. It was possible to obtain a reliable family history in 98 instances and in the case of 44 of these a history of juvenile rheumatism in a parent was unequivocal; and among these 98 children, 28 had one or more brothers or sisters afflicted with definite juvenile rheumatism. Generally speaking, Dr. McSweeney says, recurrences have been slight and brief, but it is, of course, far too early to express a definite opinion as to the permanency of results.

To prevent risk of urticaria to bathers (THE LANCET, 1930, ii., 752), Roath Park Lake was treated in March, when a third full, with a solution of 1 in 500,000 of copper sulphate. Towards the end of June the cercariæ were becoming numerous in the water-snails examined and there were a few complaints of skin eruption. The lake was again treated and bathing proceeded until the end of the season without further complaints. A case of lead-poisoning attributed to cider, drawn from a cask through a lead pipe, has come to the notice of the Welsh Board of Health, and Mr. S. Dixon, the public analyst, has made appropriate recommendations.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED DEC. 26TH, 1931.

Notifications.—The following cases of infectious disease were notified during the week:—Small-pox, 32 (last week 44); scarlet fever, 1303; diphtheria, 744; enteric fever, 36; pneumonia, 1180; puerperal fever, 33; puerperal pyrexia, 69; cerebro-spinal fever, 29; acute poliomyelitis, 7; acute polio-encephalitis, 2; encephalitis lethargica, 10; dysentery, 28; ophthalmia neonatorum, 61. No case of cholera, plague, or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on Dec. 29th–30th was as follows: Small-pox, 75 under treatment, 1 under observation (last week 80 and 0 respectively); scarlet fever, 1404; diphtheria, 1499; enteric fever, 9; measles, 597; whooping-cough, 435; puerperal fever, 18 (plus 11 babies); encephalitis lethargica, 223; poliomyelitis, 3; "other diseases," 246

(*Continued at foot of opposite page.*)

CORRESPONDENCE

RESEARCH IN ASTHMA: THE URINARY PROTEOSE.

To the Editor of THE LANCET.

SIR,—In a letter published in your columns on Dec. 5th, 1931, Dr. G. H. Oriel made reference to some work recently carried out at the Asthma Clinic, Guy's Hospital, using a "proteose" prepared by him from the urine of a patient with hay-fever asthma. At the outset of the work in question I, personally, was quite as sceptical regarding the claims made for this preparation as Dr. Freeman would still appear to remain. Positive erythema and wheal reactions were, however, obtained and recorded by slide tracings in the high proportion of cases indicated. The only conclusion appeared to be that the urine in question contained antigens or at least haptene substances derived in some manner from the pollen protein which caused the patient's attacks.

The presence of such derivatives in the urine of individuals with marked states of protein hypersensitiveness is not unlikely, in view of the conclusive demonstration by "precipitin" tests that skin reacting substances are excreted in the urine during severe reactions to bacterial infection, notably by the pneumococcus.[1] It is to be hoped that eventually evidence other than that provided by the skin test will enable a definite decision to be reached in the non-bacterial cases.

The production of an ether-urine emulsion which forms the first stage of Dr. Oriel's procedure in the preparation of his rather ill-termed "proteose" appears to involve the concentration at the emulsion interfaces of every substance which happens to be present in urine in a colloidal form. Subsequent treatment of the viscid emulsion layer with alcohol serves to precipitate such substances as have collected at the interface in an aggregated form, suitable for further extraction and purification, but may also involve partial or complete denaturation of any protein matter present, while leaving comparatively unaffected the simpler haptene substances known to be derived from bacterial breakdown.

It is not surprising therefore that, quite apart from the dermatological considerations raised by Dr. H. W. Barber, the skin test demonstration with this urinary colloidal material very frequently fails in those cases of hypersensitiveness which appear to be associated with inhaled or ingested protein.

I am, Sir, yours faithfully,

E. T. CONYBEARE.

Osler Medical Clinic, Johns Hopkins Hospital, Baltimore, Maryland, Dec. 21st, 1931.

[1] Avery, O. T.: Acute Lobar Pneumonia: Prevention and Serum Treatment. 1917. Rockefeller Institute for Medical Research. Monograph No. 7, p. 30.

PROTEIN IN ASTHMA.

To the Editor of THE LANCET.

SIR,—Dr. Behrman has pointed out (Dec. 26th, p. 1433) an apparent omission in the paper by Dr. Porter and myself which possibly we should have explained in the original. It is, however, impossible to include notes of all precautions taken without the risk of becoming tedious. We considered this question very carefully and decided that the cases themselves formed their own controls. For we could not produce any effect on a given case until we struck the right dose for that case. Also, I would point out that the type of case dealt with is more or less immune to psychological effect of a "new" treatment. They, poor things, have had so many without result. And we were careful *not* to give any suggestion of a marvellous cure. Further, although I must agree that, especially in a mild asthmatic, there *may* be a nervous factor usually associated with the time of onset of attack, the allergic state in an advanced asthmatic is in no way dependent on the nervous system.

But I may take this opportunity of mentioning to Dr. Behrman and others that one of my assistants has obtained a mild effect with proteins in epilepsy. *Not* a marked effect. And I should be grateful if someone in touch with a larger number of epileptics would make some attempt further to study this effect. Apparently the dose is considerably higher than in asthma.

Dr. Porter has not seen this letter for he is out of England. I am, Sir, yours faithfully,

THOMAS NELSON.

Grosvenor-street, Mayfair, W., Dec. 30th, 1931.

A NEW METHOD OF APPROACH TO THE SEMILUNAR CARTILAGES OF THE KNEE-JOINT.

To the Editor of THE LANCET.

SIR,—Mr. Timbrell Fisher's choice of this title for his note on the combined anterior and posterior approach to the semilunar cartilages (THE LANCET, Dec. 26th, 1931) is not fortunate, for the procedure is familiar to most orthopædic surgeons in this country; thus, amongst others, I myself have practised an identical technique for the past eight years in exceptional cases of cartilage injury. It is true that little has been written on the combined approach, but if any name, or combination of names, is to be attached in future to this operation, that of the late Alwyn Smith of Cardiff must come first. Alwyn Smith's advocacy of the combined approach can be found in the Journal of Bone and Joint Surgery (April 1925), and again in his contribution to the Robert Jones Birthday Volume (Oxford University Press, 1928), an essay written with indomitable courage during the long crippling illness which carried him from our midst. I am, Sir, yours faithfully,

Manchester, Dec. 30th, 1931. HARRY PLATT.

(*Continued from previous page.*)

At St. Margaret's Hospital there were 10 babies (plus 5 mothers) with ophthalmia neonatorum.

Deaths.—In the aggregate of great towns, including London, there were no deaths from small-pox, 3 (0) from enteric fever, 39 (8) from measles, 3 (2) from scarlet fever, 46 (5) from whooping-cough, 26 (2) from diphtheria, 43 (11) from diarrhœa and enteritis under two years, and 140 (19) from influenza. The figures in parentheses are those for London itself.

Eight of the fatal cases of measles were reported from Stoke-on-Trent and 11 from Manchester. Whooping-cough accounted for 10 deaths in Liverpool, 5 in Birmingham, and 3 in Hull. Five of the deaths from diarrhœa and enteritis were notified from Liverpool. Fourteen of those attributed to influenza were in Manchester, 9 in Liverpool, 7 in Birmingham, and 5 each in Bury, Birkenhead, and Salford.

The number of stillbirths notified during the week was 197 (corresponding to a rate of 47 per 1000 total births), including 27 in London.

PROGNOSIS IN LEUKÆMIA.

To the Editor of THE LANCET.

SIR,—So many conflicting statements have been made on the expectation of life in myeloid and lymphatic leukæmia, that I am anxious to obtain more information on this point than my own series of 127 cases affords. This is not usually available from the records of hospitals, many cases having been discharged to the care of their own medical attendant.

I write, therefore, to ask the help of your readers in this matter and to say that I should be very grateful for a brief note on any case that may have come under their observation, mentioning the type of leukæmia, age, and sex of patient, and the duration of life after the diagnosis had been made. I should also like to know whether treatment has included the use of X rays or not.

I am, Sir, yours faithfully,

A. KNYVETT GORDON.

Bedford-square, W.C., Jan. 4th, 1932.

THE ÆTIOLOGY OF "MALTA FEVER."

To the Editor of THE LANCET.

SIR,—With reference to the mention of my name in your journal of Dec. 19th, 1931, the only bacteriological equipment which I received from the then Medical Director-General consisted of air-tight glass chamber incubators in which sterilised agar-agar plates were kept; the sterile gelatine was inoculated with the blood of the patients in Bighi hospital suffering from so-called Malta fever. I made an arrangement with the hospital authorities, that whenever a patient died from that disease I should be sent for, day or night, to get a specimen of the blood and inoculate the sterilised gelatine; the plates were then put into an incubator, where the samples of the micrococcus spread, and were then examined under a high power microscope. As regards receiving apparatus from the Government authorities, the amount was small; it did not include a high power microscope. I personally purchased and paid for an oil immersion Zeiss microscope direct from Jena at a cost of 50 guineas.

If I read a foolish paper at the Epidemiological Society referring to the fever being due to the harbour water, my later work on the subject dealt only with the disease as being due to the micrococci extracted from blood immediately after death, with which the gelatine was inoculated. This refers to a period about 1889. I read a paper on the subject at a meeting of the Epidemiological Society in London, which was published in their journal; I hired 11 high power microscopes and gave a demonstration of the micrococcus cultures grown by me in sterilised agar-agar gelatine. This demonstration was given at the premises of the above society, using Zeiss oil immersion microscopes only.

I am, Sir, yours faithfully,

Lymington, Hants, Jan. 4th, 1932. A. G. P. GIPPS.

THE SERVICES

ROYAL NAVAL MEDICAL SERVICE.

Surg. Comdr. T. C. Patterson is placed on Retd. List with rank of Surg. Capt.

Surg. Comdr. to Surg. Capt.: G. F. Syms and S. Bradbury.

ROYAL ARMY MEDICAL CORPS.

To be Brevet Col.: Lt. Col. W. Benson.

To be Brevet Lt. Cols.: Majs. P. S. Tomlinson and J. M. Weddell.

E. McDonnell, late R.A.M.C., retires on retd. pay.

Col. J. W. West, late R.A.M.C., is placed on half pay.

Maj. T. H. Twigg is secd. for serv. under the Colonial Office.

Lt. H. E. Knott to be Capt.

Lt. F. G. Brown relinquishes his temp. commn.

A. A. Pullar is granted a temp. commn. in the rank of Lt.

ARMY DENTAL CORPS.

Capt. N. H. Medhurst to be Maj.

TERRITORIAL ARMY.

Majs. A. Leggat and E. W. Matthews to be Bt. Lt.-Cols.

Capts. J. E. Rusby, C. F. Mayne, and O. G. Misquith to be Bt. Majs.

Lts. S. G. M. Lynch and J. R. Wright to be Capts.

J. Simpson to be Lt.

INDIAN MEDICAL SERVICE.

Capts. R. W. H. Miller, P. A. C. Davenport, R. T. Advani, and W. C. McKee to be Majs.

ROYAL AIR FORCE.

Flight Lts. to be Honorary Squadron Leaders: J. G. Skeet and A. W. Comber.

Dental Branch: Ernest Sharp is granted a non-permanent commission as a Flying Officer.

ROYAL AIR FORCE RESERVE.

Flight Lt. to be Honorary Squadron Leader: T. M. Walker.

HONORARY SURGEON TO THE KING.

The King has approved the appointment of Air Vice-Marshal John McIntyre, *M.C.*, as an Honorary Surgeon to His Majesty, vice Group-Captain Henry Cooper, *D.S.O.*, who vacates the appointment on retirement from the Royal Air Force.

OBITUARY

NICOL RANKIN, M.C., M.B., Ch.B. Glasg.

WE regret to announce the death of Dr. Nicol Rankin at the early age of 47, which occurred on Dec. 31st, 1931. He had already established a high reputation in London in his special department of medicine, and his untimely death has cut short a promising career.

Nicol McNicoll Rankin received his medical education at the University of Glasgow, where he graduated as M.B., Ch.B. in 1908. He was a successful student, and after graduation served both as house physician and house surgeon at the Glasgow Royal Infirmary, and held resident posts also at the Western Infirmary. Appointed registrar to the Central London Throat, Nose and Ear Hospital, he was serving in this capacity at the outbreak of the war, when he joined up for regimental duties with the Buffs (East Kent Regiment). Here he inspired sentiments of respect and affection in so marked a way that the unusual honour was bestowed upon him of election to the Regimental Association, membership of which is usually reserved for regular army officers. Rankin won the Military Cross by a conspicuous act of bravery, continuing to attend the wounded and dress their injuries under a heavy barrage, after he had himself received a severe wound in the face.

At the close of the war Dr. Nicol Rankin was appointed assistant surgeon to the Central London Throat and Ear Hospital, and a few years later became full surgeon, and enjoyed at this institution just repute as a clinical observer, an operator, and a teacher. He had the confidence of his colleagues and the students associated with him, while his essential qualities were reinforced by a vein of Scottish humour which made him a genial companion. Much sympathy is felt for his widow and young family.

BENJAMIN W. THOMAS, M.R.C.S. Eng., L.R.C.P. Lond.

The death took place at his house in Welwyn on Dec. 27th, 1931, of Dr. Benjamin Wilfred Thomas, in his seventy-third year.

Dr. Thomas was the son of Dr. Benjamin Thomas of Llanelly, and was educated at Epsom College, whence he proceeded as a medical student to Charing Cross Hospital, where he filled the house appointments. He was for a time surgical registrar and chloroformist to the Royal Orthopædic Hospital, and took up general practice in 1888 in Welwyn, where he continued to practise for 40 years, retiring owing to ill-health in 1928. His work was continued with assiduity until this date, in spite of the fact that in 1916 and again in 1917 he underwent operations for cataract. Of this remarkable triumph over a serious physical disability he was rightly proud.

MEDICAL NEWS

University of London.

At recent examinations the following candidates were successful :—

M.S.

Branch I. (Surgery.)—* P. B. Ascroft, Middlesex Hosp.; A. L. Light, Univ. of Leeds; D. W. C. Northfield, Guy's Hosp.; K. H. Watkins, Univ. of Manchester; and Philip Wiles, Middlesex Hosp.

* University medal.

Branch IV. (Laryngology, Otology, and Rhinology).—C. A. Amesur, St. Thomas's Hosp.; and T. D. Deighton, St. Bart.'s Hosp.

Forthcoming Lectures.—Eight lectures on the Use of X Rays in Physiological Investigations will be given in the Physiological Theatre at Guy's Hospital, S.E., at 5 P.M. on Jan. 18th and 25th (Prof. J. M. Woodburn Morison); Feb. 1st and 8th (Prof. H. A. Harris); Feb. 15th and 22nd (Dr. A. E. Barclay); and Feb. 29th and March 7th (Dr. A. F. Hurst).—Three lectures on Serological Studies of Vaccinia will be given by Dr. W. J. Tulloch, professor of bacteriology in the University of St. Andrews, at St. Thomas's Hospital at 5.30 P.M. on Jan. 18th, 19th, and 20th.—The course on Genetic Principles in Medicine and Social Science will be continued during the Lent term by Prof. Lancelot Hogben at the London School of Economics at 5 P.M. on Fridays from Jan. 15th.—Mr. H. R. Ing, D.Phil., will give six lectures on Chemotherapy at University College at 5 P.M. on Tuesdays from Jan. 19th.—Dr. S. J. Cowell, professor of dietetics in the University, will give four lectures on Modern Aspects of Nutrition at Bedford College at 5.15 P.M. on Wednesdays from Feb. 3rd to 24th.—Three lectures on the Feeding and Nutritional Disease of the Infant will be delivered by Prof. Leonard Findlay at St. Bartholomew's Hospital Medical College at 5.30 P.M. on Feb. 8th, 9th, and 12th.—Dr. A. J. Clark, professor of materia medica in the University of Edinburgh, will lecture on the Reaction between Drugs and Cells at University College at 5.15 P.M. on Feb. 26th and 29th and March 1st.

A list of advanced lectures and practical courses in physiology to be given during the present session may be had from the Academic Registrar.

Society of Apothecaries of London.

At recent examinations the following candidates were successful :—

Surgery.—G. A. Dickson, Univ. of Sheffield; W. Hertzog, Guy's Hosp.; W. B. Mattar, St. Mary's Hosp.; C. Morgan, Charing Cross Hosp.; and B. Rivlin, Middlesex Hosp.

Medicine.—F. Crowther, Guy's Hosp.; H. T. Giblin, St. Mary's Hosp.; R. F. Hawke, London Hosp.; W. W. Parry, Guy's Hosp.; S. Ramarao, London Hosp.; B. Shapiro, Universities of Moscow and Witwatersrand; E. Teplitzky, Univ. of Berne and St. Mary's Hosp.; E. O. Watson, St. Bart.'s Hosp.; and H. A. T. Wells, Guy's Hosp.

Forensic Medicine.—J. H. Beale, Universities of Oxford and Sheffield; F. Crowther, Guy's Hosp.; H. T. Giblin, St. Mary's Hosp.; J. Irger, Univ. Coll. Hosp.; V. R. O. Lahanmi, Univ. of Manchester; R. Perkins, St. Bart.'s Hosp.; and H. A. T. Wells, Guy's Hosp.

Midwifery.—G. A. Dickson, Univ. of Sheffield; R. N. Gillespie, Royal Free Hosp.; R. F. Hawke, London Hosp.; A. A. Kahn, Med. Coll., Calcutta; E. J. Littledale, Guy's Hosp.; A. J. McBrearty, Queen's Univ., Belfast; and J. T. Moohalaparackel, Queen's Univ., Belfast.

The following candidates, having completed the final examination, are granted the diploma of the Society, entitling them to practise medicine, surgery, and midwifery :—H. T. Giblin, S. Ramarao, R. N. Gillespie, E. O. Watson, C. Morgan, and H. A. T. Wells.

Royal College of Surgeons of England.

This month Sir Arthur Keith will give six Hunterian lectures entitled Malformations of the Human Body considered from a New Point of View. They will be delivered in the theatre of the College, at 5 P.M., on Mondays, Wednesdays, and Fridays, from Jan. 18th to 29th, inclusive, and will be illustrated by specimens from the museum.

Board of Control.

On the retirement of Mr. O. E. Dickinson, the Board of Control have appointed Mr. P. Barter to be their secretary, and Mr. W. Fairley to be assistant secretary.

Medical Society of Individual Psychology.

The annual dinner of this society will be held at The Florence Restaurant, Rupert-street, London, W., on Thursday, Jan. 14th, at 7.15 for 7.30 P.M.

West London Medico-Chirurgical Society.

At a meeting of this society, to be held at the West London Hospital to-day, Friday, Jan. 8th, at 8.30 P.M., Mr. Malcolm Donaldson and Prof. A. Piney will open a discussion on the Treatment of Carcinoma.

The "Chinese Medical Journal."

The *National Medical Journal of China* has now combined with the *China Medical Journal*, and from now onwards will be issued monthly under the new title of the *Chinese Medical Journal*. It will be the only medical journal published in China in the English language. Its address is: National Medical Association Building, Tzepang and Avenue-roads, Shanghai.

Winter in England.

As announced in our last issue, a meeting of those interested in the development of British coastal health and holiday resorts will be held at the Institute of Hygiene, 28, Portland-place, London, W.1, at 3.30 P.M. on Monday next. Lord Riddell will take the chair, and the objects and methods of a proposed British Seacoast Association will be described by medical and other speakers. The hon. secretary, Miss Herz, may be addressed at the institute.

Congress of Sanitary Science.

The third Congrès International de Technique Sanitaire et d'Hygiène Urbaine will be held at Lyons from March 6th to 9th. The principal subjects of discussion will be the hygiene of transport, habitations, and places of assembly; hospitals; social work; atmospheric pollution; disinfection; and industrial hygiene. Further information may be had from Dr. Garin at the offices of the Congress, Rue Ménestrier, Lyon, France.

Order of St. John of Jerusalem.

The King has sanctioned the following promotions in and appointments to the Venerable Order of the Hospital of St. John of Jerusalem :—As Officers: Maj.-Genl. W. V. Coppinger, Lt. Col. J. S. Purdy, Maj. A. B. Cardew, Col. A. M. Connell, Dr. G. J. Linklater, and Dr. R. Owen. As Associate Officer: Lt. Col. H. Suhrawardy. As Serving Brothers: Dr. R. V. Clayton, Dr. F. S. Hardy, Dr. F. W. M. Palmer, Dr. L. L. Westrope, Dr. W. Mailer, Mr. O. A. Ehrmann, and Dr. E. S. B. Hamilton.

Appointments

BROWNE, F. W., M.B. Oxon., has been appointed Medical Officer to the Post Office, Bristol.

Vacancies

For further information refer to the advertisement columns.

Barnsley, Beckett Hospital and Dispensary.—Cas. O. £250.
Beckenham, Kent, Bethlem Hospital, Monks Orchard.—Res. H.P. At rate of £150.
Birmingham, Little Bromwich Hospital for Infectious Diseases.—Jun. Asst. M.O. £300.
Birmingham Maternity Hospital.—Res. M.O. £200.
Bolingbroke Hospital, Wandsworth Common, S.W.—H.P. At rate of £120.
Bradford Royal Infirmary.—Res. Surg. O. £225.
Brighton, Royal Sussex County Hospital.—H.S. £150.
Cambridge, Papworth Village Settlement.—Third Asst. M.O. £200.
Cardiff, Welsh National School of Medicine.—Demonstrator in Pathology and Bacteriology. £250.
Carlisle, Cumberland and Westmorland Mental Hospital.—Jun. Asst. M.O. £350.

Central London Ophthalmic Hospital, Judd-street, St. Pancras, W.C.—Sen. and Jun. H.S.'s. At rate of £120 and £100 respectively.
Chesterfield and North Derbyshire Royal Hospital.—H.S. £150.
Derby, Derbyshire Royal Infirmary.—H.P. £150.
Dreadnought Hospital, Greenwich.—Hon. Dermatologist.
Eastbourne, Princess Alice Memorial Hospital.—H.S. At rate of £150.
Evelina Hospital for Children, Southwark, S.E.—H.P. At rate of £120.
Glasgow Corporation.—P.H. Dept. Pathologist. £800.
Guildford, Royal Surrey County Hospital.—H.S. £150.
Hampstead General and N.W. London Hospital, Haverstock-hill, N.W.—H.P. At rate of £100.
Hertford County Hospital.—H.P. At rate of £150.
Hospital for Consumption and Diseases of the Chest, Brompton, S.W.—H.P. and H.S. Each at rate of £50.
Hove Hospital, Sackville-road.—Res. M.O. £200.
Huddersfield Royal Infirmary.—Res. Surg. O. At rate of £225. Also H.S. At rate of £150.
India, British Empire Leprosy Relief Association.—Medical Man. Rs.1000 to Rs. 1200 per mensem.
Kingston-upon-Hull, Anlaby-road Institution.—Asst. M.O. £300.
Liverpool and Samaritan Hospital for Women.—Hon. Asst. Surgeon.
Liverpool, David Lewis Northern Hospital.—Four H.S.'s and Two H.P.'s. Each at rate of £100.
Liverpool, Royal Children's Hospital.—Second Res. M.O. for Heswall Branch. At rate of £120.
L.C.C.—Asst. M.O.'s for Panel School Medical Work. 30*s.* per session.
Manchester, St. Mary's Hospitals.—Four H.S.'s and Jun. Asst. M.O. All at rate of £50.
Margate, Princess Mary's Hospital for Children.—Res. Med. Supt. £950.
Mile End Hospital, Bancroft-road, Mile End, E.—Asst. M.O. £350.
National Hospital, Queen-square, W.C.—Hon. Surg. Asst.
Newcastle General Hospital, Newcastle-upon-Tyne.—Res. Med. Assts. Each at rate of £150.
Northampton General Hospital.—Hon. Ophth. Surgeon.
North Middlesex County Hospital, N.—Res. Asst. M.O. £400.
Norwich, Norfolk and Norwich Hospital.—H.S. Also Cas. O. and H.S. Each £120.
Queen's Hospital for Children, Hackney-road, E.—Surg. to Ear, Nose, and Throat Dept.
Retford, Notts, Ranpton State Institution for Mental Defectives.—Med. Supt. £1000. Also Fourth M.O. £400.
St. Alfege's Hospital, Vanbrugh Hill, Greenwich, S.E.—Asst. M.O. £350.
St. John's Hospital, Lewisham, S.E.—Res. H.P. and H.S. Each at rate of £100.
St. John's Hospital, St. John's Hill, S.W.—Asst. M.O. £350.
St. Mary Abbot's Hospital, Marloes-road, Kensington.—Asst. M.O. At rate of £250.
St. Peter's Hospital for Stone, &c., Henrietta-street, Covent Garden, W.C.—Anæsthetist. £25.
Sheffield, Children's Hospital.—H.P. and H.S., and Cas. O. At rate of £100 and £80 respectively.
Sheffield Royal Infirmary.—Ophth. H.S. At rate of £80.
Victoria Hospital for Children, Tite-street, Chelsea, S.W.—Hon. Surg. Reg. Also H.P. and H.S. Each at rate of £100. Also Out-patient Anæsthetist. 10*s.* 6*d.* per attendance.
Warrington Infirmary and Dispensary.—Sen. and Jun. H.S.'s. £225 and £175 respectively.

The Chief Inspector of Factories announces vacancies for Certifying Factory Surgeons at New Southgate (Middlesex) and Falmouth (Cornwall).

Medical Diary

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

SOCIETIES.

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

TUESDAY, Jan. 12th.—5 P.M., THERAPEUTICS AND PHARMACOLOGY. 4.30 P.M., Demonstration of Oxygen Apparatus. Paper: Prof. J. S. Haldane: The Uses of Oxygen in Medicine. Followed by Dr. C. G. Douglas and Dr. R. Hilton. 8.30 P.M., PSYCHIATRY. Cinematograph Demonstration. Dr. Noel H. M. Burke: Some Aspects of Mental Deficiency.

WEDNESDAY.—5 P.M., SURGERY: SUB-SECTION OF PROCTOLOGY. Cases: Mr. W. S. Perrin: 1. Chordoma. Mr. L. E. C. Norbury: 2. Extensive Prolapse of Rectum. Specimens: Mr. Ernest Miles: 1. Recurrent Procidentia Recti with Diverticulosis. 2. Secondary Sarcoma of Pelvic Colon. Mr. L. E. C. Norbury: 3. Endothelioma of Rectum. Mr. W. B. Gabriel: 4 and 5. Carcinoma of Cæcum. Mr. Lawrence Abel: 6. Myxo-fibroma of Small Intestine. 7 and 8. Lipoma of Large Intestine. 9. Fibroma of Anterior Surface of Cæcum. Mr. Naunton Morgan: 10. Carcinoma Simplex of Rectum. 11. Endothelioma of Rectum. Other cases and specimens will be shown. Paper: Mr. Lawrence Abel: The Pecten (illustrated by coloured cinematograph film).

FRIDAY.—5.30 P.M., PHYSICAL MEDICINE. Paper: Mr G. C. Simpson, D.Sc. (Director of Meteorological Office): Meteorological Factors which may Affect Health. 8.15 P.M., OBSTETRICS AND GYNÆCOLOGY. Specimens: Mr. T. G. Stevens: 1. Rhabdosarcoma of the Cervix. Mr. L. Carnac Rivett: 2. Foreign Body Found in the Intestine after Cæsarean Section Ten Years Previously. Paper: Prof. E. C. Dodds: The Bearing of Recent Research on the Sex Hormones on Clinical Obstetrics and Gynæcology. Discussion: Speakers: Prof. A. S. Parkes, Dr. H. Gardiner-Hill, and Dr. B. P. Wiesner. 8.30 P.M., RADIOLOGY. Discussion: Some Physical and Medical Aspects of X Ray Dosage in Malignant Disease. Opening papers: Mr. W. V. Mayneord: The Measurement of Penetrating Radiations in Therapy. Dr. F. Hernaman-Johnson: Old and New Theories with Regard to X Ray Dosage in Cancer. Dr. N. Finzi: X Ray Dosage in Malignant Disease. Followed by Dr. A. Burrows, Dr. Goldsborough, Prof. Hopwood, Dr. J. E. Lynham, Dr. G. Scott, Dr. J. Webster, and others.

MEDICAL SOCIETY OF LONDON, 11, Chandos-street, Cavendish-square, W.1.

MONDAY, Jan. 11th.—8 P.M., Pathological Meeting.

HARVEIAN SOCIETY OF LONDON.

THURSDAY, Jan. 14th.—8.30 P.M. (at the Paddington Town Hall, W.). Annual general meeting. Presidential address by Sir Thomas Horder.

SOCIETY OF MEDICAL OFFICERS OF HEALTH.

FRIDAY, Jan. 15th.—5 P.M. (at 1, Upper Montague-street, Russell-square, W.C.), Discussion on Causes of the Decline in Tuberculosis Mortality, opened by Dr. G. Lissant Cox, and Dr. Ernest Ward.

SOCIETY FOR THE STUDY OF INEBRIETY.

TUESDAY, Jan. 12th.—4 P.M. (at 11, Chandos-street, W.). Discussion on Mental Defectiveness and Alcohol and Drug Addiction. Opener: Dr. W. Norwood East.

BRITISH INSTITUTE OF RADIOLOGY, 32, Welbeck-street, W.

THURSDAY, Jan. 14th.—8.30 P.M., Further discussion of Dr. Ffrangcon Roberts's paper on the International Protection Recommendations.
FRIDAY.—Morning visit to the Research Department, Woolwich.—5 P.M., Discussion on Bone Tumours. (Opener: Dr. James Brailsford.)

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.

MONDAY, Jan. 11th, to SATURDAY, Jan. 16th.—MEDICAL SOCIETY OF LONDON, 11 Chandos-street, W., Monday, 8.30 P.M., Dr. W. Langdon Brown: The Endocrines and the Sympathetic Nervous System. (First of six lectures on Endocrinology. Fee.) Wed., 4 P.M., Dr. E. H. R. Harries: Modern Treatment of Common Infectious Diseases. (First of nine lectures on Treatment. Fee.) Syllabuses from the Fellowship.

WEST LONDON POST-GRADUATE COLLEGE, West London Hospital, Hammersmith, W.

MONDAY, Jan. 11th.—10 A.M., Gynæcological Wards: Genito-urinary Operations; Skin Department. 11 A.M., Surgical Wards. 2 P.M., Surgical Wards: Medical, Surgical, Eye, and Gynæcological Out-patients.
TUESDAY.—9.30 A.M., Operations. 10 A.M., Medical Ward Demonstration; Dental Department. 11 A.M., Throat Operations. 11.30 A.M., Surgical Demonstration. 2 P.M., Operations; Medical, Surgical, and Throat Out-patients.
WEDNESDAY.—10 A.M., Medical Wards; Children's Medical Out-patients. 2 P.M., Medical, Surgical, and Eye Out-patients. 2.30 P.M., Gynæcological Operations. 4.45 P.M., Venereal Diseases Demonstration.
THURSDAY.—10 A.M., Neurological Department. 11.30 A.M., Fracture Demonstration. 2 P.M., Medical, Surgical, Eye, and Genito-urinary Out-patients. 2.30 P.M., Operations.
FRIDAY.—10 A.M., Medical Wards, Skin Department, Dental Department. 12 noon, Medical Lecture. 2 P.M., Operations, Medical, Surgical, and Throat Out-patients.
SATURDAY.—9 A.M., Throat Operations. 10 A.M., Medical Wards, Surgical and Children's Out-patients.

ST. MARK'S HOSPITAL, City-road, E.C.

THURSDAY, Jan. 14th.—4.30 P.M., Dr. J. Browning Alexander: Constipation and Obstipation.

KING'S COLLEGE HOSPITAL MEDICAL SCHOOL, Denmark-hill, S.E.

THURSDAY, Jan. 14th.—9 P.M., Dr. H. A. Lucas: Serum Treatment in Practice.

CENTRAL LONDON THROAT, NOSE, AND EAR HOSPITAL, Gray's Inn-road, W.C.

FRIDAY, Jan. 15th.—4 P.M., Mr. J. D. McLaggan: Eczematous Condition of the Ear and Nose.

LONDON SCHOOL OF DERMATOLOGY, St. John's Hospital, 49, Leicester-square, W.C.

TUESDAY, Jan. 12th.—5 P.M., Sir E. Graham Little: Cicatricial Alopecia.
THURSDAY.—5 P.M., Dr. W. J. O'Donovan: Stocking Erythroderma.

WESTERN INFIRMARY, Glasgow.

WEDNESDAY, Jan. 13th.—4.15 P.M., Dr. George A. Allan: Medical Cases.

NOTES, COMMENTS, AND ABSTRACTS

PREVENTIVE MEDICINE IN ITS RELATION TO AVIATION.

BY E. GOODWIN RAWLINSON, M.D., D.P.H.,
DIRECTOR OF THE BACTERIOLOGICAL DEPARTMENT, ROYAL INSTITUTE OF PUBLIC HEALTH.

AIR transport has now become so important a factor in the life of the community that preventive medicine must seriously take into account the new problems that inevitably have arisen.

The Pilot.

Medicine in aviation has naturally, up to the present, been chiefly concerned with the pilot. He is the keyman of all flying. His selection and fitness must always be the primary consideration, and examinations at fixed intervals by the same highly trained specialists are necessary to ensure that his efficiency is unimpaired; to note the influences and conditions under which he works. Everything that has a bearing, directly or indirectly, upon his flying health should be observed and rigidly supervised.

Many ingenious tests have been devised for this purpose, and in no other branch of medicine has the psychological side been so well stressed, and its importance so well appreciated as in the selection and care of the aviator.

The medical branch of the Royal Air Force has shown great resource and initiative in dealing with the various difficult problems with which it has been so violently faced, and the pioneer work of Flack, Stamm, Head, and many others,[1] necessarily sets a standard for medicine dealing with the pilot in civil aviation. Most of the pilots engaged in civil aviation transport have been trained in the Service and the system of short-term engagement makes it likely that this will be so for a considerable time to come.

The candidate to become a pilot in civil transport is finally examined at the Air Ministry in London. The medical examinations are carried out here by the same people, the same apparatus, under the same conditions, in the same atmosphere. It will be readily understood that, for such vital, stringent, and complex tests and such comparatively new work, the advantage of these being carried out always by the same personnel is great, and that it will be very difficult to delegate them to a decentralised authority. The value of impressions obtained, too difficult to define, the intuitive knowledge that must be gained, all tend to make this extremely personal and limiting. So too with such work still in its infancy, new devices and experiments are continually being elaborated, which could only be properly evaluated by those already steeped in the work.

The would-be pilot undergoes a super-insurance examination as to his family history, his personal habits, tastes, hobbies; his education and the minutiæ of his occupation since his school days. This being satisfactory, his selection will depend upon what are known as physical efficiency tests.[2] These are devised to determine the conditions of his cardio-vascular system, respiratory capacities, vision, hearing, nervous and muscular reactions. To pass these tests he must prove to be a piece of perfect mechanism both mental and physical, with capabilities of unerring judgment. After a period of training, if satisfactory, he receives certificate B. (the public transport certificate). This must be renewed at six-monthly intervals after re-examination. A woman pilot holding such certificate is re-examined every three months.

The conditions of the pilot's work obviously are of the utmost importance and should come under the supervision and control of a competent authority—at present the Air Ministry. They have a vital effect on his efficiency, and the peculiar nature of his work is such that the easement of any arduous factor makes for safer flying.

The length of flying-time must be regulated, the periods of waiting must be considered; where must the pilot be housed during such periods of his employment, what must he do that he be not depressed—a condition fraught with trouble for pilots? His reaction to night flying should be noted.

The employing company cannot always appreciate that small and apparently trivial difficulties are vital in their reactions. The maker of the machines, in his engineering enthusiasm, unconsciously adds to the pilot's troubles by altering or adding controls, changing what has been an automatic reaction to an extraconscious action—a possible source of error in rapid judgment. The necessity for standard controls cannot be too strongly urged; and every effort should be made to lessen the number of instruments the pilot must watch—air speed indicator, altimeter, oil and petrol gauges, compass, &c.—and these tend to increase. So, too, everything that will minimise the result of an accident to him, such as the special padding of the cockpit, the automatic parachute, tends to give him a certain relaxation of the tenseness of expectancy.

These are all subjects that come under the purview of preventive medicine in aviation as well as a consideration of the length of a pilot's occupational life, the problem of his after career, and the assurance of more than a pittance when his comparatively short flying life is done. It must affect his efficiency if he has a conscious or a subconscious worry as to what is to become of his wife and family, in case of total disability, or—feeling a lessened vitality from a quickening staleness—as to the results of his next medical examination.

It must always be an axiom that the pilot (apart from the machine) is the paramount factor of flying.

The Passenger.

Air transport companies between Great Britain and the continent carried 48,253 passengers in 1929.[3]

AIR-SICKNESS.

There are no statistics available to show how many of the 48,253 suffered air-sickness, but it is stated to be not negligible. Apart from the mental bias to sickness and the unusual movement, probably four main factors tend to operate in the causation of this troublesome condition: poor ventilation, lack of warmth, noise, and vibration; the first being the most important. A reasonable altitude, per se, does not appear to have any bearing on sickness.

The problem of changing the air of the small cubic space allowed to each passenger is a difficult one. To change the air sufficiently often to keep it fresh means draughts. If draughts are prevented then the sense of "stuffiness" arises, due, as Leonard Hill [4] has shown, to lack of the removal of the air next the skin and enmeshed in the clothing.

The heating of the air presents some engineering difficulties. Air heated by contact with hot pipes leading from the exhaust may contain noxious gases and the possibilities of leakage. Humidity and warmth might be measured and controlled by passing air through steam.

The Handley Page 42-seater on the India route has a cubic capacity of approximately 4000 c. ft., giving slightly less than 100 c. ft. per passenger. Hot and cold air inlets are provided at each pair of seats. The *Argosy* on the Paris service, seating 20 passengers, gives about 54 c. ft. to each person. (This does not compare unfavourably with crowded suburban trains.) A room in a dwelling-house is required to have 1000 c. ft. space for each person.

We know from experience that continuous and particularly unusual noise is fatiguing; it is one of

the problems of our mechanised age. The noise of the actual explosion of the cylinders of the engine may be reduced, but in so doing, Heald [5] has pointed out, the unpleasant screaming of the timing gears then become predominant. Vibration he also notes can become fatiguing, and thus may be a reflex cause of sickness. Exhaustive experiments in the sound proofing of aeroplane cabins are being carried out by different authorities.[6]

An investigation promoted by the Daniel Guggenheim Fund for the Promotion of Aeronautics [7] was concluded by the observation that few people are troubled by air-sickness in properly built and efficiently piloted aircraft.

Research carried out by Marrack,[8] as to a fundamental cause of sea-sickness, showed that ketosis occurred in nearly all subjects within 24 hours after vomiting commenced, but that it was incidental, and evidence of a metabolic change which itself may be the cause. According to Flack [9] the connexion between sea- and air-sickness appeared to be slight, though in cases where the labyrinth was unduly sensitive the subject would be both sea-sick and air-sick. Flack also noted that where the labyrinth did not seem to be involved, ocular muscle imbalance was the primary condition. Maitland,[10] in work carried out at the same time as both the above, observed that a passenger can only partially counteract a sudden, unexpected arrest of movement and a change of direction, by bodily adjustment; "the eye fails to pick up the datum levels, to rectify erratic information received by the semi-circular canals."

Much general experience goes to show that all subjects react very differently, as to the various factors which set up the impulse, and that different senses and functions are involved in different people.

DISPOSAL OF EXCRETA.

The Air Ministry regulations [11] at the present time prohibit the dropping of articles from the air, with certain exceptions, but the exceptions apply to excretal matter, a problem that requires urgent attention. It is almost safe to say that at the present time, when a passenger or a pilot urinates or defæcates whilst in the air, the excreta, liquid and solid, is simply allowed to scatter on the four winds of Heaven. This anachronism would never have been permitted had there been visible evidence. No palpable mass can be observed—the height at which it is released being sufficient to cause division into small particles or drops.

The layman will perhaps argue that such division and the exposure of the fine particles to wind, rain, and sun (particularly the sun) is all that can be desired to make such material harmless, although he probably would object on æsthetic grounds; and it may be argued by the more knowledgeable that the bacterial content of the healthy intestine is not of a disease-producing type and that those who are flying or travelling by air are the most likely to be of a healthy normal type. It has been estimated, however, that about 1 in 1000 of the population is a typhoid carrier [12]—apar tfrom other intestinal disease carriers—and there appears no reason why human carriers of the salmonella group of bacteria should not exist. The dysentery carrier cannot he absolutely disregarded, and on the air routes of Africa, Asia, and South America, dysentery, cholera, and helminth carriers are important, and can be contributors to disease broadcast in such a manner.

If the above estimate is right the Imperial Airways and other companies possibly transported 27 typhoid carriers in 1929. True, they may not all have defæcated or urinated whilst in the air, but it is certain that a proportion of them did so.

What happens to the finely divided particles? Each minute mass is attached to a droplet of moisture and the bacteria present are protected with a coating of fæcal matter from being killed by the sun's rays and the moisture present is necessary for their existence. In calm weather a gradual deposition takes place in the area in which it is dropped. In windy weather it is carried great distances: it may remain suspended in the air, wafted by slight currents; but whatever the weather or conditions there is every possibility of its being finally deposited or blown direct into an open water-supply, on to human food, or taken into the lung. Air routes pass over reservoirs and water-supplies, or in close proximity. Close or distant, the danger exists.

It may be said that we are accustomed to breathing in an atmosphere laden with bacteria among which are intestinal organisms, or that the possibilities of disease arising from aeroplane passenger traffic at present is very slight. But each year sees a larger number of people taking to air, each year the ends of the earth are brought closer, and where definite air routes are established in countries where intestinal disease, such as dysentery and cholera, are both endemic and epidemic, the increase in the danger becomes more marked.

Suggested measures.—There appear to be several possible ways for dealing with excreta on aeroplanes, but the present design and construction of the machine is not such as to expect or allow elaborate, weighty, or bulky mechanism for such purposes, and sanitary authorities would be well advised to be satisfied with simple and possibly primitive devices at first.

For passenger-carrying machines a small, standard, aluminium tank or box could be fitted in the lavatory, containing a small amount of disinfectant of high coefficient. The tank should be of sufficient size to take the excreta of half the number of passengers carried. The size necessary for ten people for a three to four hour journey would be approximately 1¼ gallons. (The amount of excreta for 24 hours per person is taken as about 50 oz. of urine and an average of 5 oz. of fæces.) The tank would be preferably of an ink-well pattern; a detachable funnel-top fitting into a cylindrical container with an incurved rim. These would be replaced at the air-port by one of a standard pattern, and the used one emptied, disinfected, and prepared ready for use again.

A further development might be devised at a later date—a tank jacketted for steam, if such were available, or hot air from the exhaust, by which the excreta would be rapidly dried. This would necessitate an exhaust ventilation for fumes and perhaps a method of removing the dried material from the chamber, but if the heat generated was sufficient to dry the material very rapidly, the tank would have the advantage of a very small size and diminished weight of excreta.

A device for breaking down the solids by compressed air and then rendering them innocuous before discharge into the air would probably require too complex machinery for practical use.

For a single-seater machine, a valved funnel arrangement could be planned with a plenum device for forcing the matter by air to a small tank at the rear of the fuselage.

Excreta taken from the machines at air-ports would readily be dealt with where the air-port was favourably situated near a large town, but the establishment of air-ports in primitive surroundings would necessitate the method of disposal best suited for the area.

THE CARRYING OF DISEASE.

As civil aviation increases and international boundaries become of lesser import, the utmost stringency will be imperative to prevent epidemics. The Royal Air Force as a fighting force has control of all the units it carries, but in civil aviation problems arise with regard to the transport of units over which much less control can be exercised; unless, as pointed out by Massey,[13] the very purpose of the speed of aviation is destroyed.

It is now possible to travel half round the world whilst sickening for a disease. A man could drink a typhoid-infected water in the Antipodes and show no signs of it until after he had disembarked from an aeroplane at Croydon. And though the danger of the introduction of disease into this country by aeroplane is not yet very great, each day brings us a little closer to the subtropics and the tropics.

The danger of the spread of the yellow fever mosquito across Africa by air travel has already been urged by James.[14] Draft regulations concerning this

type of menace already exist and in some countries, such as South America, are actually in force; coastwise seaplane services along yellow fever regions must land and embark passengers at a certain distance from shore.

As an Empire country we must necessarily envisage all the possibilities of the spread of tropical disease by air; cholera, dysentery, and plague, not only into this country, but from one Dominion to another. Yet is seems that our greatest immediate danger from this means is the introduction into, and the spread in the British Isles, of influenza, the exanthemata and the diseases caused by filtrable viruses. In 1930 42,435 passengers were carried between the continent and Great Britain by air.[15] With the cursory supervision possible at present, how great a potentiality for these diseases in their incubation periods?

Without nullifying the very object of aviation, the control of communicable disease will prove to be one of the most difficult problems preventive medicine has had to face. At present our quarantine is under the primary control of H.M. Customs and aeroplanes are cleared as ships. Unless blatantly ill no sick passenger would have much difficulty in evasion, and virulent disease could land with little hindrance.

A bill of health from the port of embarkation has been suggested. This is already in force in certain countries; often it may have little value. It will be readily seen that a passenger hurried by car to the air-port with just enough time to embark (and this is not unusual) is somewhat perfunctorily examined. Also, different countries have not the same standards.

The possibilities of the future would seem to lie in the following directions:—

(1) Reorganisation of the quarantine service and its transfer, as far as aviation is concerned, to the Ministry of Health. At present aircraft in this respect are governed by maritime regulations. Conditions are so different it is self-evident that reorientation is inevitable.

(2) The employment of whole-time medical officers in such quarantine service, and the establishment of small quarantine hospitals at air-ports.

(3) An extension of the use of consular reports telegraphed as to the daily health at this official's station as well as the reports of the Office Internationale d'Hygiène Publique.

(4) The establishment of regulations of an elastic nature and subject to frequent revision.

(5) Immunisation preliminary to travel from epidemic areas.

Some of these points have been discussed by Holden.[16]

The knowledge that a close scrutiny of passengers was carried out on disembarkation would tend to deter a certain number of incubationary carriers. It may be possible at some future date to devise some rapid method of diagnosing "not quite wellness," because it is this state, or lack, of health that must almost always be considered in the aeroplane passenger.

It must be emphasised that authority should endeavour to carry out a measure of control, efficient and elastic, in order that the purpose and development of aviation be not hampered. Even under the best auspices there is no doubt that the more the extension of our freedom as to time and space, the more the restriction of our liberty, where the health of the community is involved. (The dangers of transmission of disease by aircraft apply to all forms of transport, and it would be reasonable, whilst setting this house in order, to give some attention to our far from perfect protection from the same type of disease on cross-channel boat traffic and in trains.)

Accidents.

Confidence in aircraft is becoming established. The number of accidents involving regular passenger traffic may be regarded as almost minimal. During the year 1929–1930, with the Imperial Airways one accident occurred and four persons were killed representing one killed per 360,000 miles flown or one killed for 6270 passengers carried.

On examining the causes of accidents, French figures[17] for 1923–1925 are available and the impressive fact emerges that out of 100 accidents the percentage of causes are in almost constant proportion—over half are due to faulty airmanship (errors of judgment) and less than one-quarter to engine failure. American statistics[18] bear this out. They show about 56 per cent. due, as they put it, to personnel, and 19 per cent. to power plant failure. Our own figures for 1929[19] are still higher, 70 per cent. due to errors of judgment (faulty pilotage). These figures emphasise very strongly the urgent necessity of considering no factor too trivial where the pilot is concerned.

All first-aid outfits on passenger machines should include large and small dressings, iodine or other antiseptic in ampoules, spirits of ammonia, and a dressing for burns. All air-ports should be equipped with a dressing station complete with emergency tools and fire extinguishers.

Surgery in connexion with aviation differs but little from that concerned with accidents generally; mainly in degree. Major injuries do not bulk so largely as might be expected. An admirable and interesting analysis of such accidents is given in a work by Graeme Anderson.[20]

Merchandise.

The carrying of merchandise in ships from foreign ports calls for the inspection of cargo for disease-carrying vermin such as rats which may be infested with plague, fleas, or actual carriers of this and other diseases. Cargo and ship must be disinfected; deratisation and measures for rat-proofing carried out.

The same applies, on a small scale at the present time, to merchandise carried in aeroplanes. Such traffic is still in an elementary stage; mail, gold, and precious stones are common air cargoes but with an extension of such traffic to include materials or foodstuffs, a search for parasites, rats, and insect pests will be imperative.

A new condition also arises to that obtaining in ship transport. The shortened period of the journey by aeroplane may allow arthropod disease-carriers to be landed alive in this country that would not otherwise have survived the longer period on a ship. Other insect pests, so introduced, might well have an economic importance in causing destruction of plant or cereal crops.

The entomologist has made use of the aeroplane in the search for and distribution of the natural enemies of similar pests; locusts and grasshoppers are sprayed from the air, in the effort to arrest their destructive progress. The sanitarian has been able to destroy mosquito larvæ over large tracts of country by spraying larvicides from planes.

Health Services.

The aeroplane has already proved of great value in countries where natural cataclysms frequently occur and where ordinary means of communication are destroyed. Rapid organisation of sanitary measures is an urgent necessity after earthquakes or great floods for first-aid work, to prevent epidemic disease, establish food- and water-supplies, and to rush chlorinating apparatus and disinfectants to the affected areas. The recent earthquake in New Zealand and the large flooded districts of the Mississippi are apt examples.

Mobile laboratories, portable X rays and operating units are not dreams of the future in aviation, but are either in being or on the way to reality. The ambulance aeroplane is a standard Royal Air Force equipment. Antitoxin has been hurried to Alaska; cultures of cholera vibrio have been brought from Basra by air to London for the preparation of vaccines to be returned in the same manner, to replenish depleted supplies during an epidemic.

The health services of the future also promise a use of aviation for therapeutics, metabolism is stimulated by flying—its tonic effect is marked; airmen have also noticed that the common cold reacts favourably to flights at high altitudes. But in a country like England where sunlight is so often infrequent one can foresee the possible establishment of sunlight clinics in the air—airships for altitude treatment of

heart and respiratory diseases. Instead of prescribing a child a few minutes exposure to the sunlight lamp, we may be ordering a flight at such and such an altitude for half an hour. We have a Leysin directly over our heads all day and every day.

Finally, medicine is to gain from the meteorological research now being carried out on the strata of air at very high altitudes.

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HOCKEY INJURIES.

THE casualties at football in America, described by our correspondent from U.S.A. on p. 100, are more fatal and more serious than one would expect, even in the course of a violent game. That few disabling accidents follow hockey has recently been shown by Dr. A. Arnold,[1] of the medical department of the Leipzig University Institute for Physical Exercises. He has recently published his observations on injuries received at hockey in a paper based on their occurrence in 2152 games in which over 23,000 players took part. Like Dr. Glass,[2] who had made similar observations on sets of hockey players, Dr. Arnold classified the injuries into two groups according as the person affected was obliged to give up playing for from three to five minutes, or to abandon the game altogether. In men's teams the incidence of injuries was 0·35 per cent., in boys' teams 0·25 per cent., and in women's and girls' teams 0·34 per cent., or a total incidence of 0·33 per cent. In 38 per cent. the injury was caused by the hockey stick, and in 19 per cent. by the ball, while 43 per cent. were classified as due to indirect causes—i.e., not peculiar to hockey, but such as might occur in any sport—e.g., a fall or collision with another player. The frequency of injuries varied with the different groups of players. As regards the site of the injuries inflicted by the hockey stick the head was affected in 43 per cent., the lower extremities in 33 per cent., the upper extremities in 17 per cent., and the trunk in 7 per cent. of the accidents. The sites of the injuries inflicted by the balls showed a somewhat similar distribution. On the other hand, in injuries due to indirect causes the upper and lower extremities were most frequently affected. The duration of the incapacity caused by the injury was in most cases very short. Only three of the 30 players injured by the stick and only three of the 15 injured by the ball were unfit for playing for longer than a month. On the other hand, of 34 injured by indirect causes, 20 were still unable to resume playing after a month. Three had to give up hockey altogether—one from injury to the kidney and two from injury to the knee. Dr. Arnold comes to the conclusion that since serious injury seems to be rare, and the muscular movements which hockey calls into play are of great variety, the game should be recommended from the medical point of view.

[1] Deut. med. Woch., Dec. 25th, 1931, p. 2175.
[2] Arch. klin. Chir., Bd. 184, p. 742.

COMPULSORY PASTEURISATION OF MILK.

THE Manchester public health committee has approved a memorandum from Dr. R. Veitch Clark, the medical officer of health, proposing that the city council should take powers to insist that all the milk supplied to the city—except certified and Grade A (tuberculin tested)—should in future be pasteurised. As a condition of registration in the business it is intended that the authorities should require the installation of a satisfactory pasteurising and cooling plant, and should undertake the necessary examination and inspection. In order to obviate hardship it is suggested that a year should elapse between the passage of the act and its enforcement. The *Manchester Guardian* states that already about three-quarters of the city's milk-supply is pasteurised.

THE JAMES MACKENZIE INSTITUTE FOR CLINICAL RESEARCH.

THE annual report of this institution shows that the work initiated there is being steadily carried on. During the year 97 new cases and 1150 additional notes were added to the files, while 795 specimens were examined in the laboratories. A complete survey of the records having now been made, certain groups of cases are to be investigated in furtherance of the principles of Sir James Mackenzie's viscero-motor and viscero-sensory reflex theory. Individual members of the staff have studied the ætiology of the common cold and its relationship to carbohydrate intake, the effect of fatique on the position of viscera, the cause of bacilluria, and have surveyed the physical state of children under 5. The scheme of continuous observation of children up to school age is a useful means of investigating the primary causes of ill-health and of ensuring early treatment.

Births, Marriages, and Deaths

BIRTHS.

ANDERSON.—On Dec. 27th, 1931, at Hong-Kong, the wife of James W. Anderson, M.B., Ch.B., F.R.C.S. Ed., of a daughter.

CHITNIS.—On Dec. 20th, 1931, in a Birmingham nursing home, the wife of C. N. Chitnis, M.R.C.S., L.R.C.P., of a son.

COLLEY.—On Dec. 13th, 1931, the wife of R. Colley, M.B., Ch.B., D.O.M.S., of The Circus, Bath, of a son.

RICE.—On Dec. 26th, 1931, at Thorpe-road, Norwich, the wife of Dr. R. A. C. Rice, of a son.

MARRIAGES.

CRUICKSHANK—LOCKHART.—On Dec. 24th, 1931, at the Parish Church, Great Shelford, near Cambridge, Douglas Barron Cruickshank, L.R.C.P. Edin., L.D.S., D.P.H. Camb., to Hilda Joyce, third daughter of Mr. and Mrs. E. W. Lockhart, of Riversdale, Great Shelford.

DEATHS.

ALCOCK.—On Dec. 27th, 1931, George Herbert Alcock, M.R.C.S., L.R.C.P.

BIRD.—On Jan. 3rd, at 27, St. Peter's-road, St. Margaret's-on-Thames, Tom Bird, M.A. Oxon., M.R.C.S., Anæsthetist to Guy's Hospital 1881 to 1903, Consulting Anæsthetist since 1903, aged 88 years.

BROWN.—On Jan. 3rd, suddenly, Joseph Norwood Brown, M.D. Lond., of Finchley-road, N.W.

BROWN.—On Dec. 21st, 1931, at Mayfield, Hatch End, Andrew Brown, M.D., M.R.C.P., in his 91st year.

CAREY.—On Dec. 31st, 1931, at Saumarez House, Guernsey, Lieut.-Colonel John Thomas Carey, late R.A.M.C., aged 80 years.

HOLBECHE.—On Dec. 25th, 1931, at his residence, Priors Croft, Malvern, Arthur Oliver Holbeche, M.R.C.S., &c., in his 77th year.

HOLTON.—On Dec. 24th, 1931, suddenly, Francis William Parke Holton, M.R.C.S., L.S.A., aged 74.

PITT.—On Jan. 1st, at Brandhoek, Gerrards Cross, Edward Pitt, L.D.S., R.C.S. Eng.

THOMAS.—On Dec. 27th, 1931, at Welwyn, Herts, Dr. Benjamin Wilfred Thomas, third son of the late Dr. Benjamin Thomas, of Llanelly.

WALKER.—On Dec. 27th, 1931, at Peterborough, Russell Ernest Walker, M.B., F.R.C.S.E.

WINTER.—On Dec. 24th, 1931, at The House that Jack Built, Wolverhampton, Walter Henry Trimnell Winter, M.R.C.S., L.R.C.P.I., son of the late G. W. Winter, of Ceylon.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages and Deaths.